California High-Speed Train Project

Agreement No.: HSR 13-06
Book 3, Part D, Subpart 5

Design Variance Report

Prepared for
CALIFORNIA High-Speed Rail Authority

Table of Contents

California High-Speed Train Project

DESIGN VARIANCE COVER SHEET

Design Variance Request Number	0006
Design Variance Request Title	Fresno Station Crossover Distance from Station

Prepared by:

URS/HMM/Arup	10-6-11
Regional Consultant	Date

PMT Review:

Richard Schmedes	11-8-11
Systems	Date
John Chirco	11-9-11
Infrastructure	Date
Joseph Metzler	10-21-11
Operations/Maintenance/Safety	Date
Frank Banko	10-12-11
Rolling Stock	Date
Vladimir Kanevskiy	11-4-11
Regulatory Approvals	Date
Tony Murphy	10-28-11
System Integration	Date

PMT Recommended:

Thomas Tracy	11-19-11
PMT Regional Manager	Date

PMT Approval:

Ken Jong	11-16-11
Engineering Manager	Date

Agency Concurrence:

CHSR Authority Chief Engineer	Date

HSR 13-06 - EXECUTION VERSION

CHSR Authority Chief Engineer

CHST DESIGN VARIANCE REQUEST FORM

Part 1 – Design Variance Request Information

Title/Subject: Fresno Station Crossovers' Distance from Station

Number: URS-OPS-0-0006 **Revision: 0**

Contract Name & Number (Final Design): HSR 06-0003

Region: Fresno - Bakersfield

Location: Fresno

Regional Consultant's / Third Party Design Drawing Reference: TT-D1011 to TT-D1016

Date Submitted to RMT & PMT

PREPARED / SUBMITTED BY: NAME: Richard Coffin COMPANY: URS/HMM/Arup A Joint Venture Company SIGNATURE: DATE: 10/06/11	

**Note design variance numbers will follow the same convention:* "ABC" will abbreviate the name of the firm submitting the variance, "DEF" abbreviates the name of firm receiving the variance request, "X" is the revision number starting from 0, and the last four

numbers count the number of total submittals staring from one.

Part 2 – Design Variance Request Information

CHSTP DESIGN REQUIREMENT Include reference to drawings, design criteria, technical memos, specifications	TM2.1.3 – Turnouts and Station Tracks Rev 0, 06/29/09 Figure 6.1.4 stipulates the desirable run time to determine the "minimum distance between the end of station turnout and crossover turnout, where they are on the same track," should be 1.5 seconds, or a minimum of 1 second. Verbal advice from EMT stated that station crossovers should not be more than a mile from the station.
DESIGN CRITERIA REQUIRING A VARIANCE	Desirable run time to determine the "minimum distance between the end of station turnout and crossover turnout, where they are on the same track," should be 1.5 seconds, or a minimum of 1 second.
REASON FOR REQUESTING A VARIANCE	Crossovers for Fresno stations at STA 10851+72.74 to 10863+11.37 and 108664+61.37 to 10876+00.00. Station platform ends are at 10970+00. This is a maximum separation of 14,127ft.
JUSTIFICATION FOR VARIANCE	Fresno Station is centered on Mariposa St and the station platform track approaches extend from Stanislaus St to the north and Santa Clara St to the south. The high-speed rail (HSR) descends into trench immediately after Stanislaus St in order to cross under abutments supporting the SR180 overcrossing of the Union Pacific Railroad (UPRR) tracks, spur tracks belonging to the San Joaquin Valley Railroad (SJVR) Company, and a canal that crosses under both the UPRR and the SJVR. The HSR is on a vertical curve as the tracks descend into the trench followed by a constant gradient of only 800ft at a gradient of 1.550%, followed by another vertical curve and then another section of 1,000ft at a constant gradient of -1.900%. The HSR emerges from the trench and is back at-grade on a constant gradient of 0.110% around 9,000ft (1.7 miles) to the north of the station platform turnouts. There are no sufficiently long sections at a constant gradient within the trench to accommodate a crossover with a design speed of 110mph (i.e., 1,139ft).
PROPOSED ALTERNATIVE DESIGN	Continue an at-grade alignment between W

REQUIREMENT	Olive and the station. This would require grade separation junction to carry the SJVR spurs (if feasible) and closure of Dry Creek. SR180 would require major works to the embankments and probable reconstruction of the abutments of the bridge crossing UPRR. It may be feasible to provide a crossover on the 1,000-foot section of constant gradient within the trench, but this would require the imposition of an 80mph speed restriction due the short crossover. This option was not recommended.

Part 3 – Impact Analysis

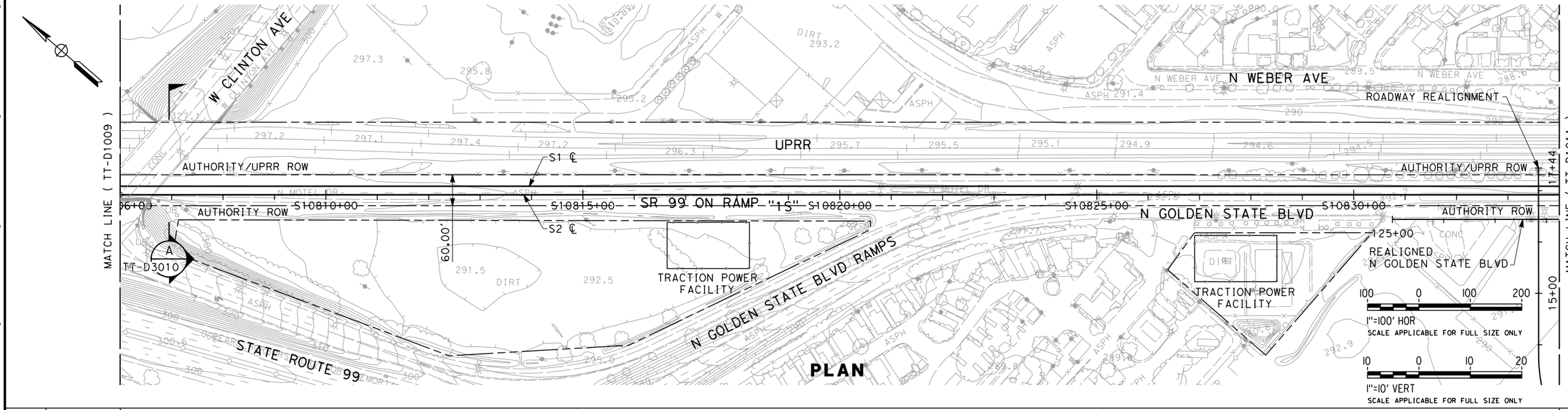
OPERATIONS	Increased run time required for trains to negotiate the crossover at the northern approach to the station. It is believed use of crossovers would not be a normal event but probably during perturbation or maintenance.
MAINTENANCE	None identified
INFRASTRUCTURE	None identified
RAILROAD SYSTEMS	None identified
RELIABILITY / FUNCTIONALITY	None identified
THIRD PARTY (Utility, Freight, Caltrans, RR, other)	Consultation required with UPRR and Flood Control district regarding Dry Creek if alternative considered.
SAFETY AND SECURITY	None identified
DIRECT COST	Alternative – As pre previous at grade scheme.
OTHER	Revised impact assessment will be required.

Part 4 – Mitigation measures

OPERATIONS	None identified
MAINTENANCE	None identified
INFRASTRUCTURE	None identified
RAILROAD SYSTEMS	None identified

Part 5 – List of Supporting Documentation to Design Variance Request

ANALYSIS	N/A
PUBLICATION/STANDARD EXTRACTS	N/A
RISK ASSESSMENT	N/A
DRAWINGS	30% Draft TT-D1010 to TT-D1016
CALCULATIONS	N/A
EXPERT TESTIMONIALS	N/A
CORRESPONDENCE	N/A
OTHER	N/A



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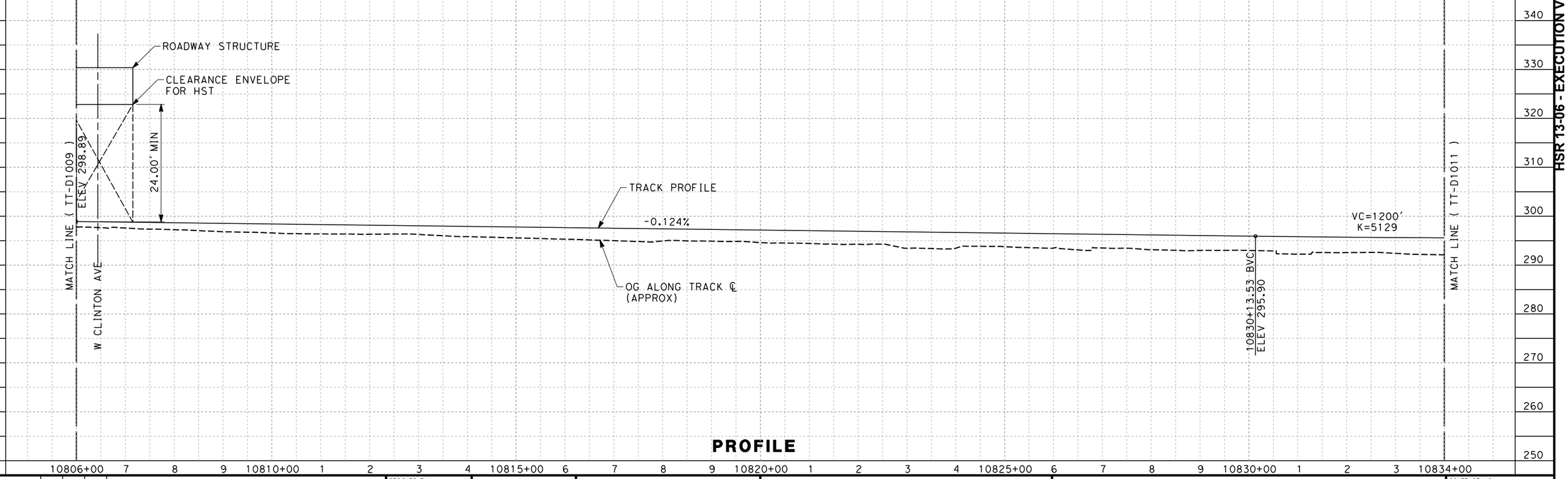


PROFILE

REV	DATE	BY	CHK	APP	DESCRIPTION

DESIGNED BY K. SEYMOUR
DRAWN BY P. TONKIN
CHECKED BY D. HUNT
IN CHARGE R. PRUST
DATE 09/15/11

30% DRAFT SUBMITTAL FOR INTERNAL USE ONLY

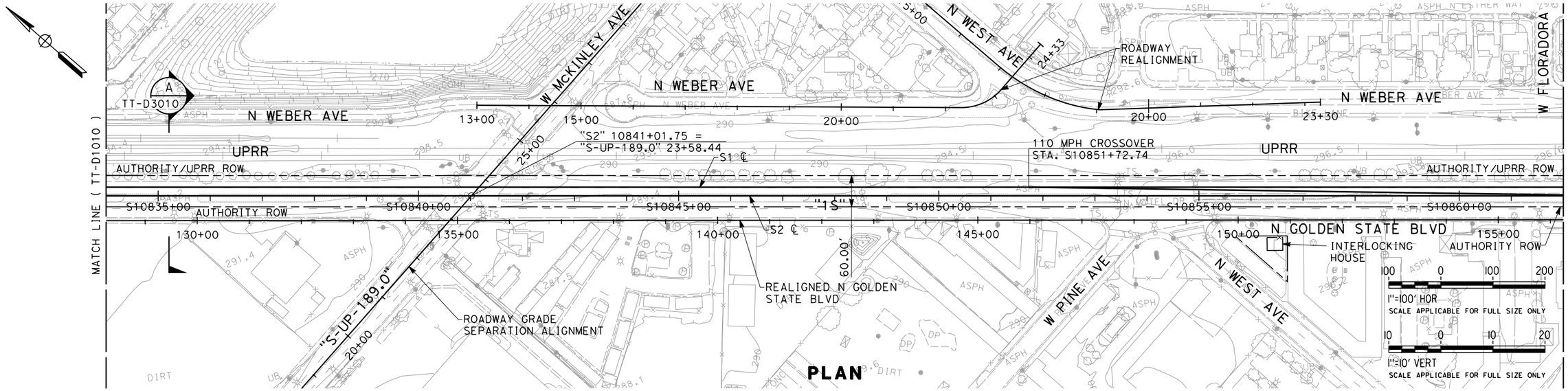
NOT FOR CONSTRUCTION

URS | HMM | ARUP
CALIFORNIA HIGH-SPEED TRAIN

CALIFORNIA HIGH-SPEED RAIL AUTHORITY

CALIFORNIA HIGH-SPEED TRAIN PROJECT
SIERRA SUBDIVISION
PACKAGE 1
PLAN AND PROFILE
STA. 10806+00 TO 10834+00

CONTRACT NO.
DRAWING NO. TT-D1010
SCALE AS SHOWN
SHEET NO.



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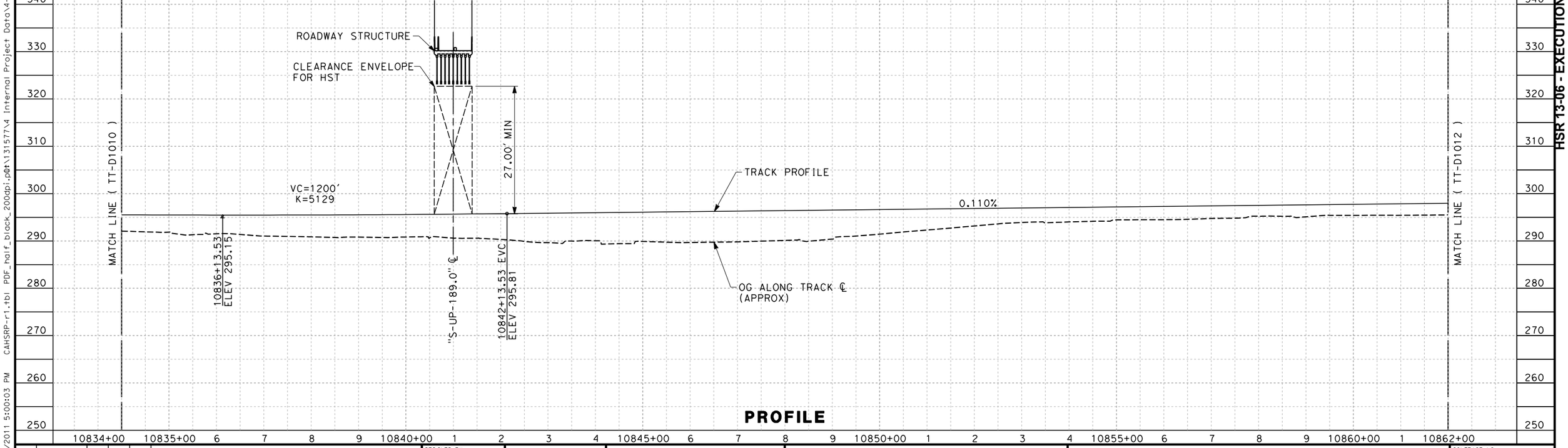

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STA. 10834+00 TO 10862+00

CONTRACT NO.
DRAWING NO. TT-D1011
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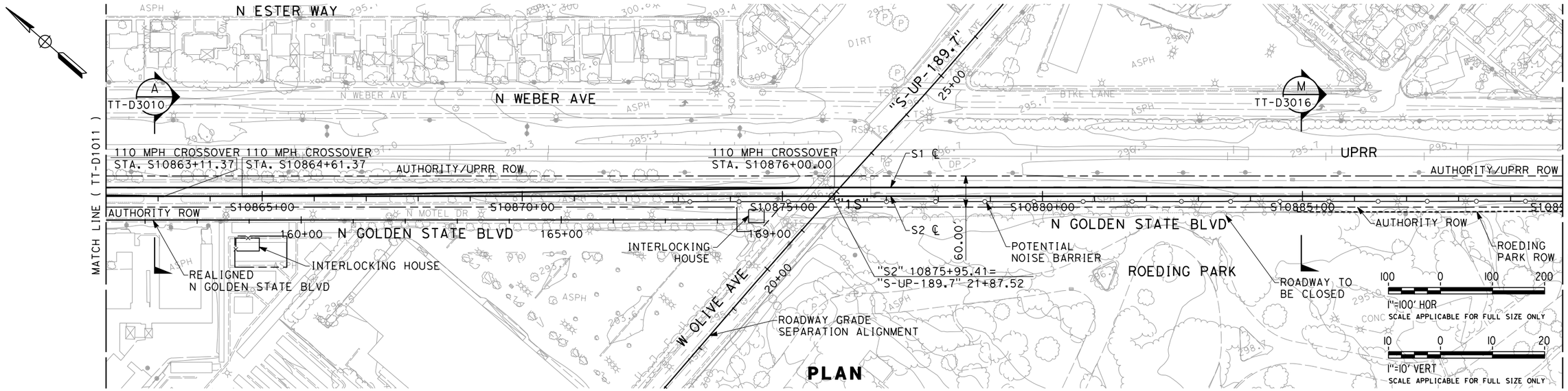

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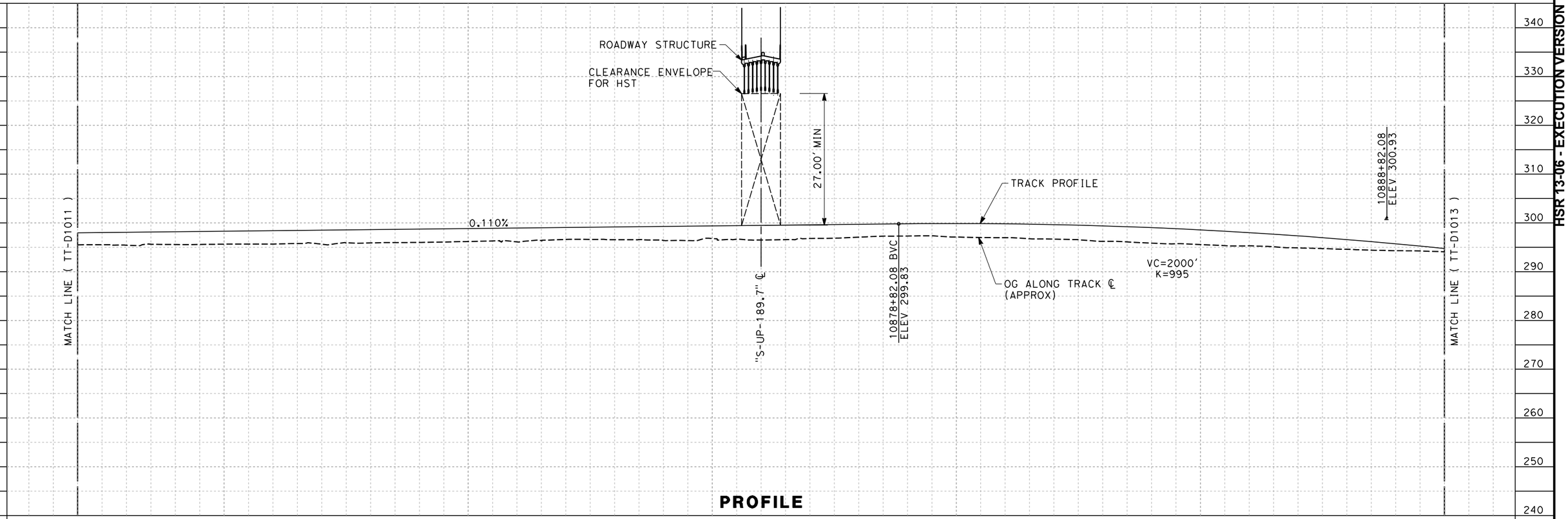

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PLAN AND PROFILE
STA. 10862+00 TO 10890+00

CONTRACT NO.
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SCALE AS SHOWN
SHEET NO.

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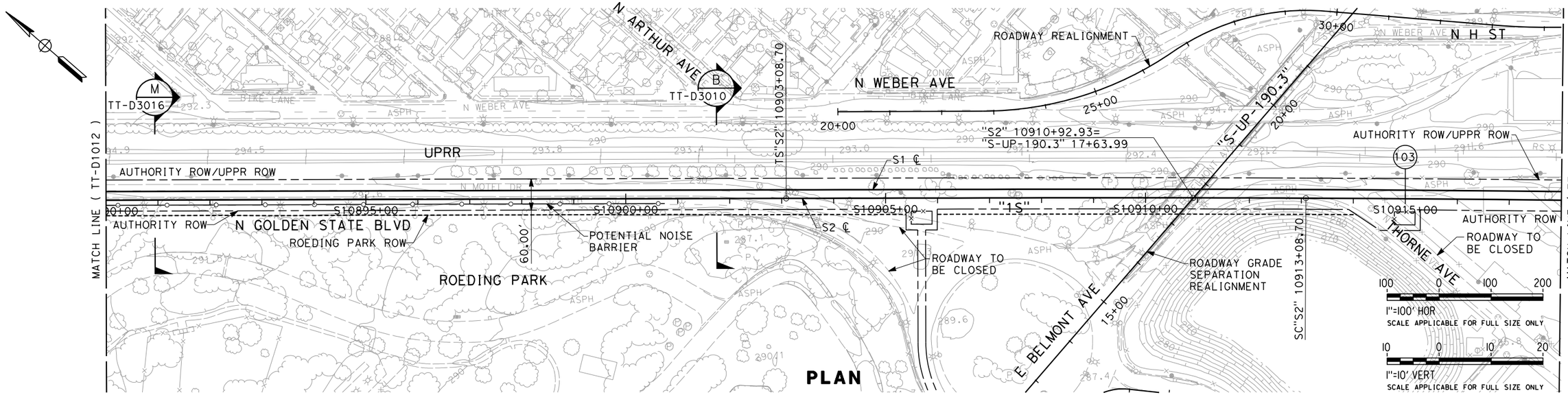

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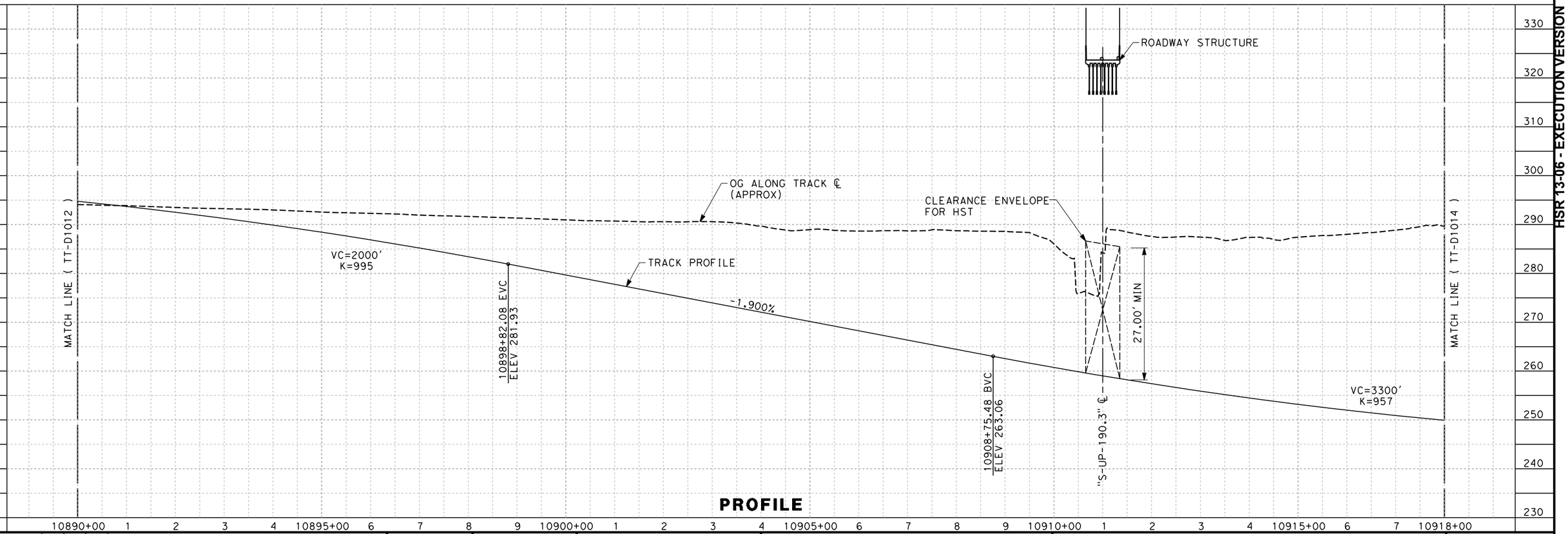

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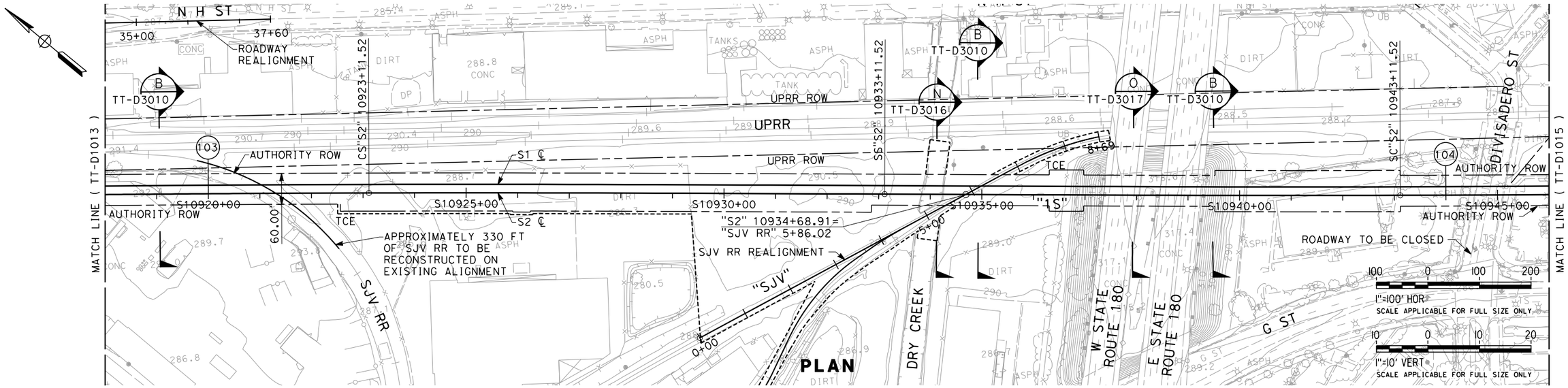
PACKAGE 1
PLAN AND PROFILE
STA. 10890+00 TO 10918+00

CONTRACT NO.
DRAWING NO. TT-D1013
SCALE AS SHOWN
SHEET NO.



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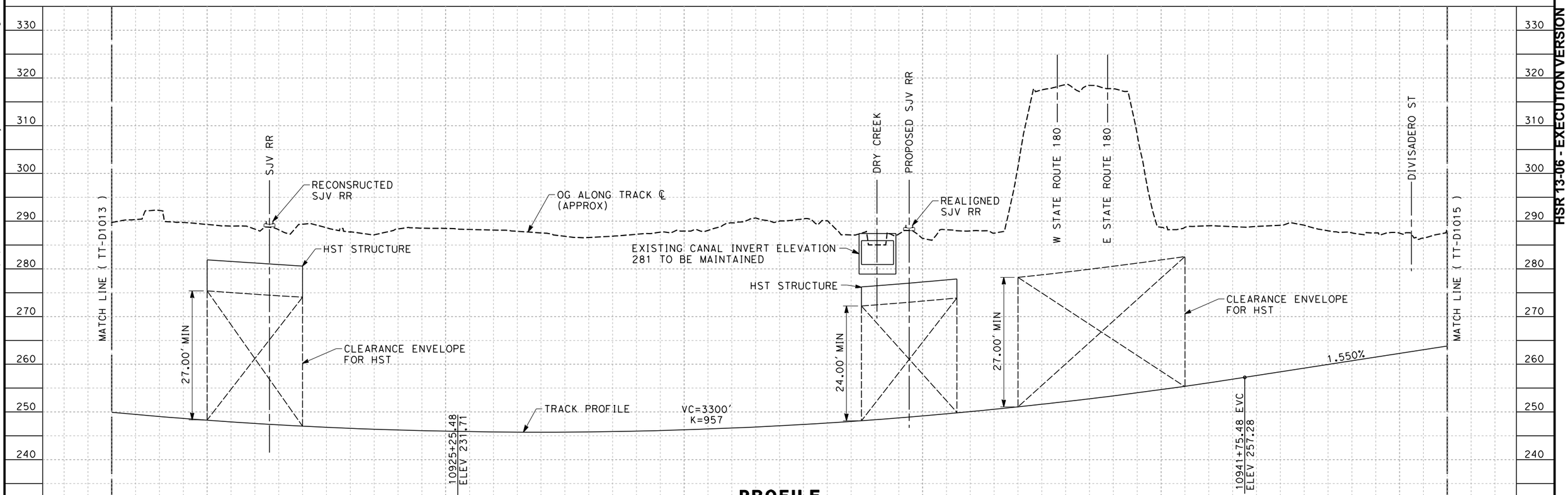

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IN CHARGE R. PRUST
DATE 09/15/11

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PLAN AND PROFILE
STA. 10918+00 TO 10946+00

CONTRACT NO.
DRAWING NO. TT-D1014
SCALE AS SHOWN
SHEET NO.

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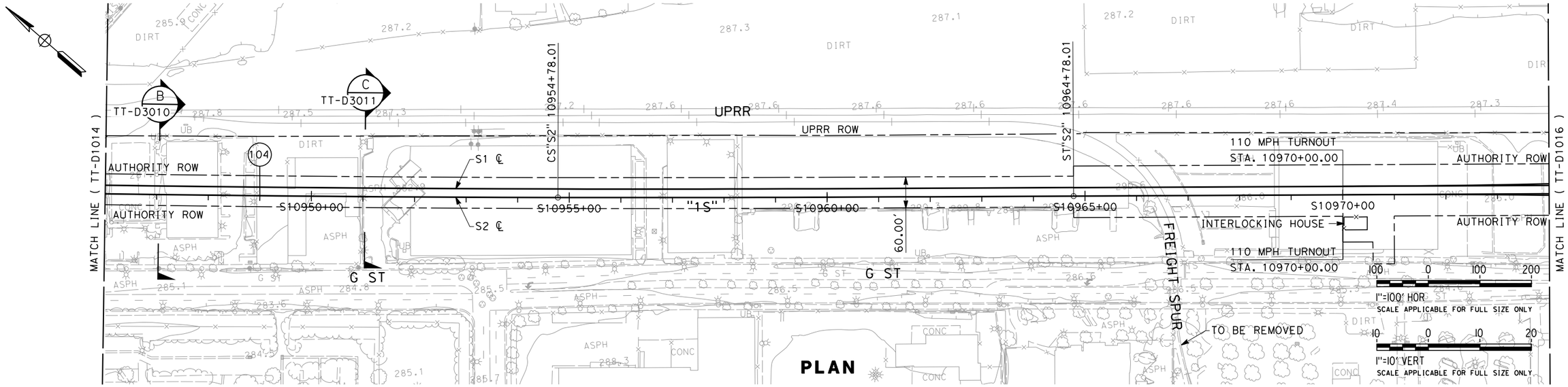

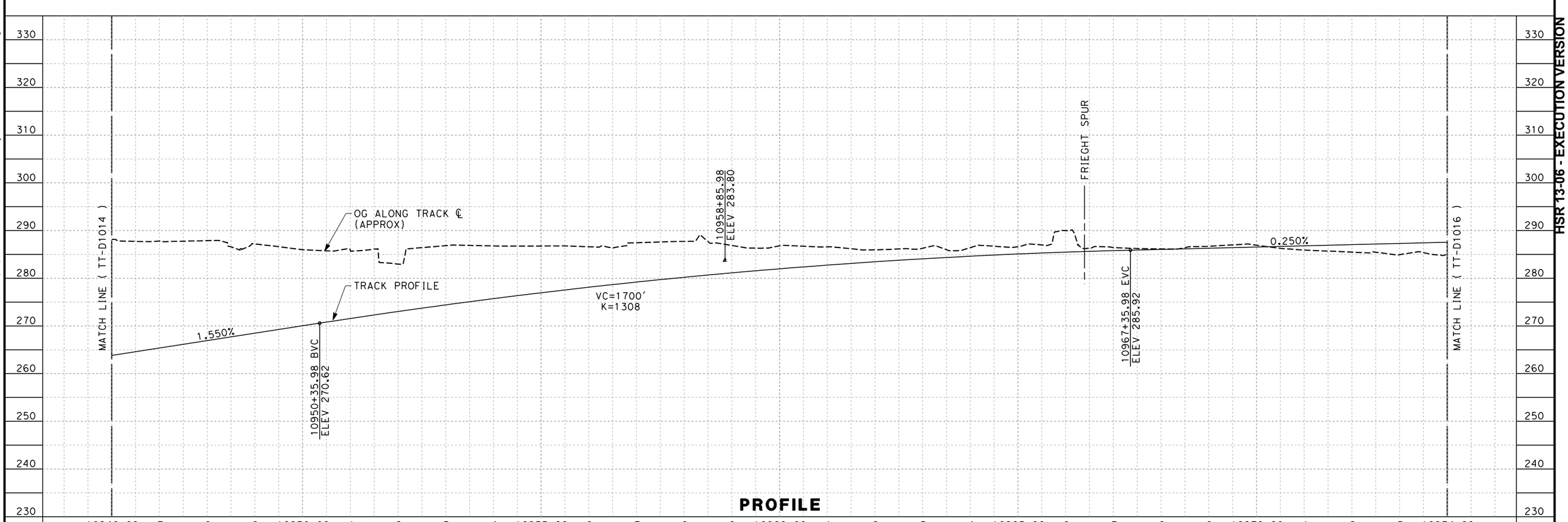

REV	DATE	BY	CHK	APP	DESCRIPTION

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DRAWN BY P. TONKIN
CHECKED BY D. HUNT
IN CHARGE R. PRUST
DATE 09/15/11

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SIERRA SUBDIVISION
PACKAGE 1
PLAN AND PROFILE
STA. 10946+00 TO 10974+00

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DRAWING NO. TT-D1015
SCALE AS SHOWN
SHEET NO.

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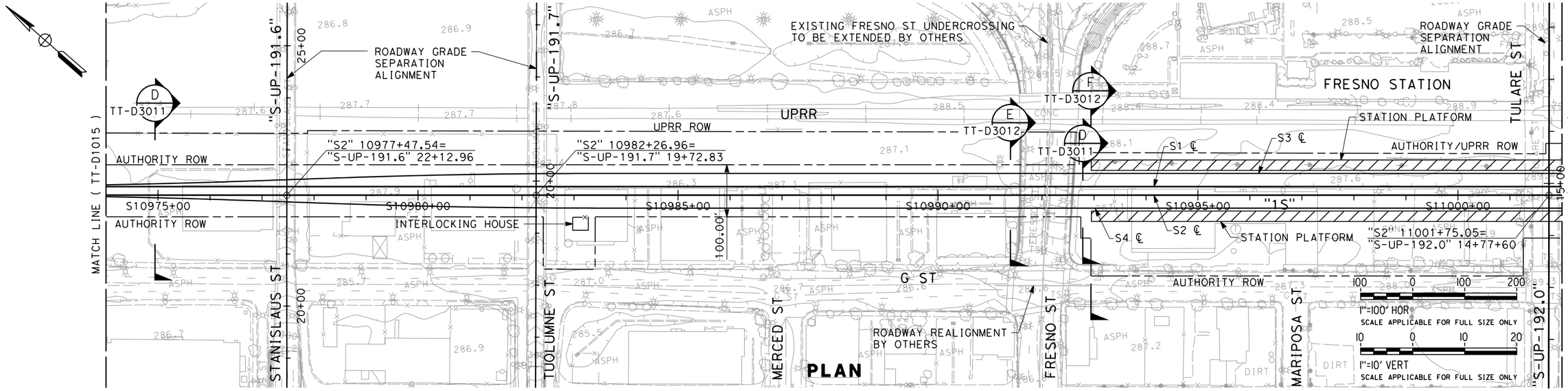

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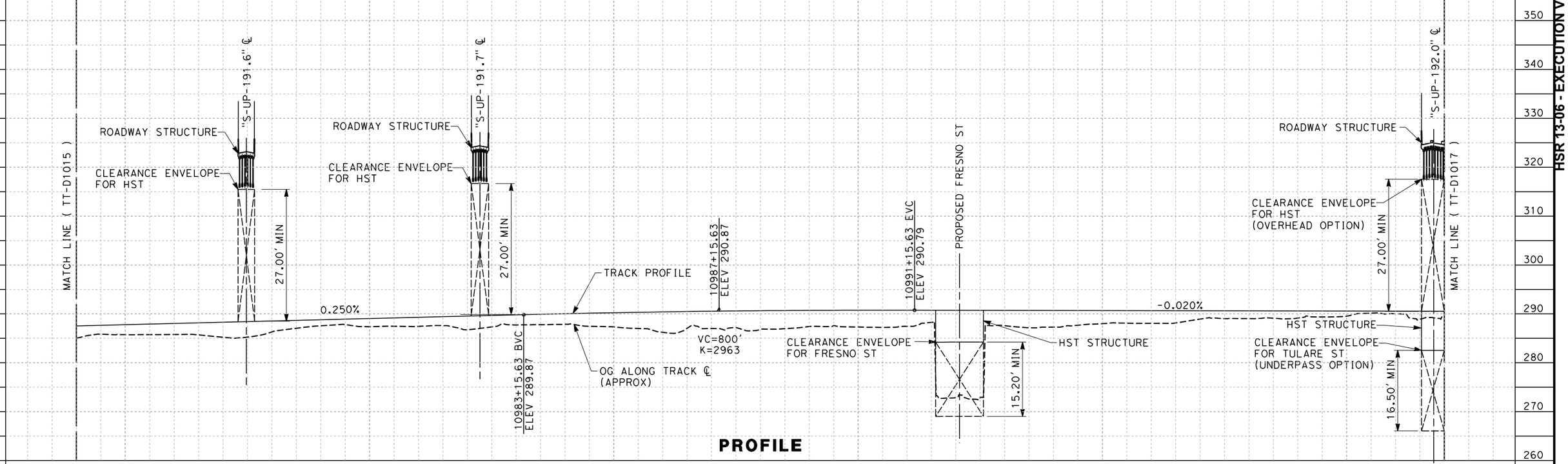

PROFILE

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DATE 09/15/11

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CALIFORNIA HIGH-SPEED RAIL AUTHORITY

CALIFORNIA HIGH-SPEED TRAIN PROJECT
SIERRA SUBDIVISION
PACKAGE 1
PLAN AND PROFILE
STA. 10974+00 TO 11002+00

CONTRACT NO.
DRAWING NO. TT-D1016
SCALE AS SHOWN
SHEET NO.

California High-Speed Train Project

DESIGN VARIANCE COVER SHEET

Design Variance Request Number	0004
Design Variance Request Title	HST Track Alignment Spiral / Vertical Curve Overlap

Prepared by:

AECOM	9-16-11
Regional Consultant	Date

PMT Review:

Richard Schmedes	11-4-11
Systems	Date
John Chirco	10-27-11
Infrastructure	Date
Joseph Metzler	11-7-11
Operations/Maintenance/Safety	Date
Frank Banko	10-12-11
Rolling Stock	Date
Vladimir Kanevskiy	11-4-11
Regulatory Approvals	Date
Tony Murphy	11-4-11
System Integration	Date

PMT Recommended:

Peter Valentine	11-7-11
PMT Regional Manager	Date

PMT Approval:

Ken Jong	11-7-11
Engineering Manager	Date

Agency Concurrence:

CHSR Authority Chief Engineer	Date

HSR 13-06 - EXECUTION VERSION

Title/Subject: **HST Track Alignment Spiral/Vertical Curve Overlap**

Number: AECOM-SYS-0-0004 **Revision: 0**

Contract Name & Number (Final Design): HSR06-007

Region: **Merced - Fresno**

Location: **Fresno County**

Regional Consultant's / Third Party Design Drawing Reference:

Date Submitted to RMT & PMT

PREPARED / SUBMITTED BY: NAME: Alan Boone/Angela Shields COMPANY: AECOM SIGNATURE: DATE: (09-16-2011)	

*Note design variance numbers will follow the same convention: "ABC" will abbreviate the name of the firm submitting the variance, "DEF" abbreviates the name of firm receiving the variance request, "X" is the revision number starting from 0, and the last four numbers count the number of total submittals starting from one.

Part 2 – Design Variance Request Information

CHSTP DESIGN REQUIREMENT Include reference to drawings, design criteria, technical memos, specifications	TM 2.1.2 Section 6.1.7
DESIGN CRITERIA REQUIRING A VARIANCE	No overlap allowed between spiral curves and vertical curves for HST track alignment.
REASON FOR REQUESTING VARIANCE	To keep the top of rail profile as close to existing ground as possible thus avoiding the need for embankment fill or retaining walls.
JUSTIFICATION FOR VARIANCE	To avoid unneeded additional capital cost to the project.
PROPOSED ALTERNATIVE DESIGN REQUIREMENT	Allow overlap of vertical curves with spiral curves.

Part 3 – Impact Analysis

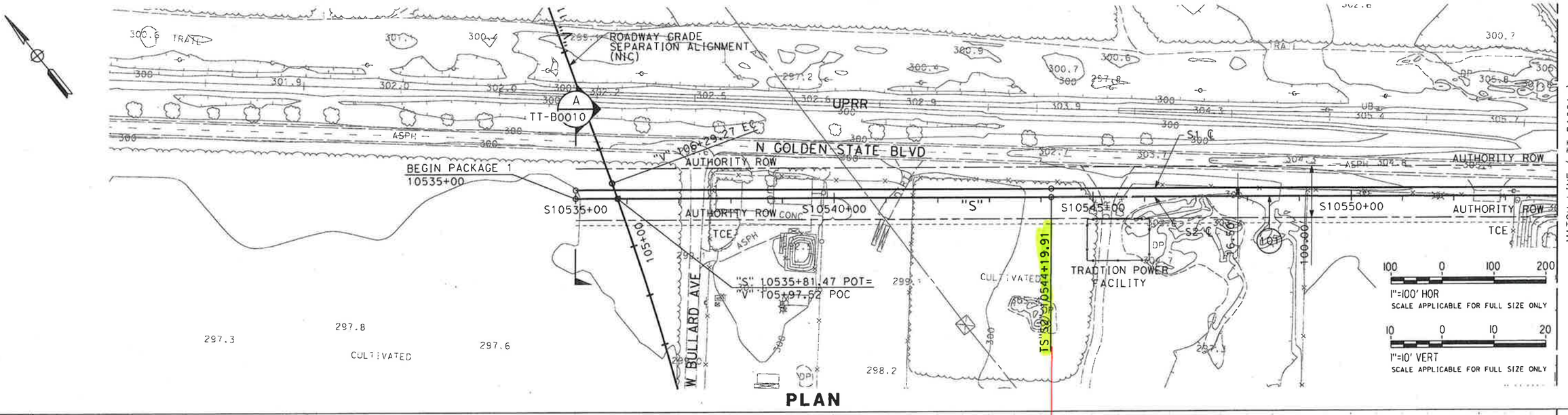
OPERATIONS	N/A
MAINTENANCE	Possible slight increase in maintenance costs due to complexity of HST track alignment.
INFRASTRUCTURE	**General** The HST alignment must pass underneath a proposed roadway overcrossing at Veterans Blvd. (station S10535+81) and a new roadway overcrossing at Shaw Ave. (station S10628+87). Between these locations the HST alignment will cross Herndon Canal on a new bridge at station 10592+66. The top of rail profile is designed to pass under the two roadway overcrossings and must rise to provide sufficient structure depth for the Herndon Canal bridge while maintaining proper freeboard over the water surface. There are three locations where the spiral/vertical curve overlaps. Location 1 is the vertical curve at station S10548+36 which overlaps the spiral on curve #101. Location 2 is the vertical curve at station S10592+66 which overlaps the spiral on curve #102. Location 3 is the vertical curve at station S10610+51 which overlaps the spiral on curve #102. **Reason** Moving the two vertical curves identified above will result in a raised the top of rail profile between the proposed vertical curve PVI locations, a distance of approximately 4,430 feet. The top of rail would be approximately 8 feet higher along this section. This raised profile will require additional embankment fill along the 4,430 feet to accommodate the raised track profile. **Other Options** Another option would be to introduce additional

	vertical curves within this area of the alignment however this will result in a "roller coaster" type of effect for HST patrons. **Justification** The raised top of rail profile will require additional embankment fill, thus adding cost to the project. The increased embankment would eliminate the opportunity for open drainage ditches thus requiring a closed drainage system.
RAILROAD SYSTEMS	N/A
RELIABILITY / FUNCTIONALITY	N/A
THIRD PARTY (Utility, Freight, Caltrans, RR, other)	N/A
SAFETY AND SECURITY	N/A
DIRECT COST	No detailed cost estimate. The increased cost of the embankment and inclusion of a closed drainage system would alone will be in excess of $500,000.
OTHER	Possible increased maintenance cost of drainage system.

Part 4 – Mitigation Measures

Part 5 – List of Supporting Documentation to Design Variance Request

ANALYSIS	See discussion above and attached exhibits.
PUBLICATION/STANDARDS EXTRACTS	N/A
RISK ASSESSMENT	N/A
DRAWINGS	See Attached
CALCULATIONS	N/A
EXPERT TESTIMONIALS	N/A
CORRESPONDENCE	N/A
OTHER	



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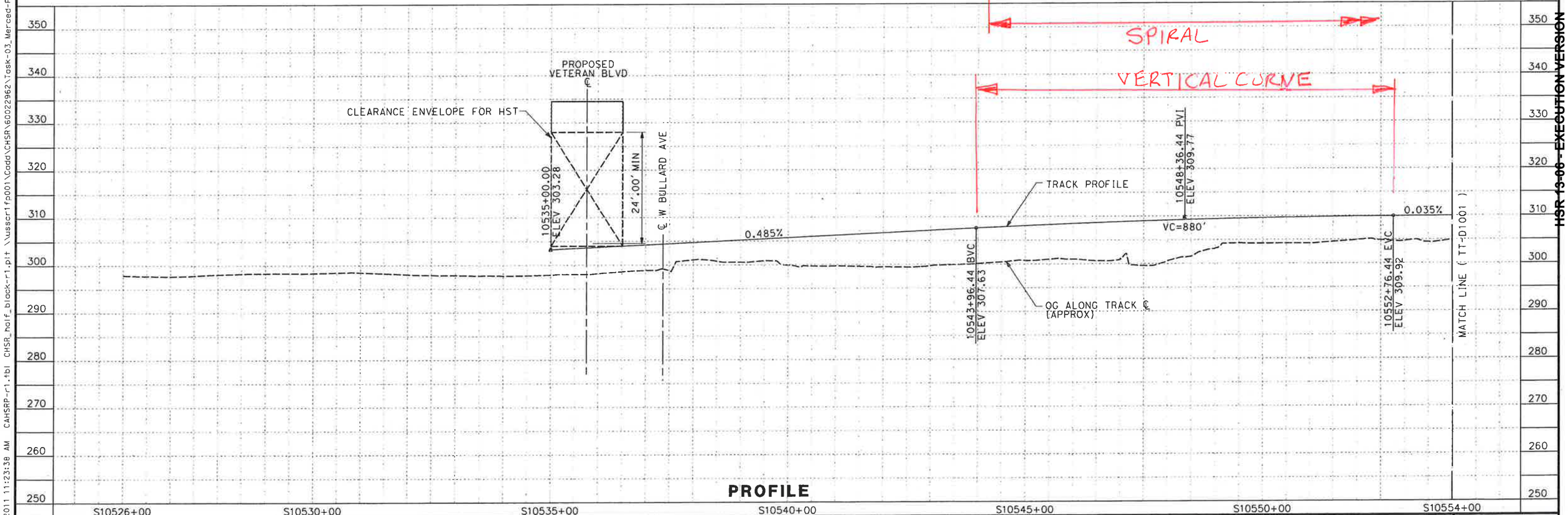

PROFILE

REV	DATE	BY	CHK	APP	DESCRIPTION

DESIGNED BY A. SHIELDS
DRAWN BY H. SULLIVAN
CHECKED BY H. PHAN
IN CHARGE A. BOONE
DATE 08/31/2011

30% IN-PROGRESS SUBMITTAL FOR INTERNAL USE ONLY

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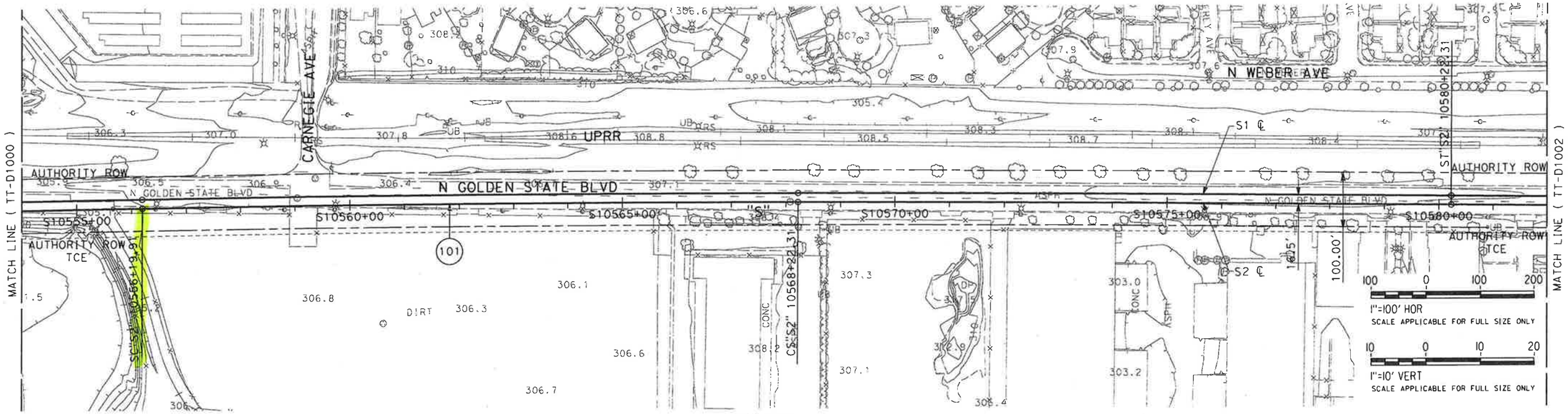
AECOM Technical Services, Inc.
2020 L Street, Suite 300
Sacramento, CA 95811
CH2MHILL

CALIFORNIA HIGH-SPEED RAIL AUTHORITY

CALIFORNIA HIGH-SPEED TRAIN PROJECT
SIERRA SUBDIVISION
PACKAGE 1
TRACK GUIDEWAY
PLAN AND PROFILE
STA. 10535+00 TO 10554+00

CONTRACT NO.
DRAWING NO. TT-D1000
SCALE AS SHOWN
SHEET NO. XX OF XX

HSR 13-00 - EXECUTION VERSION



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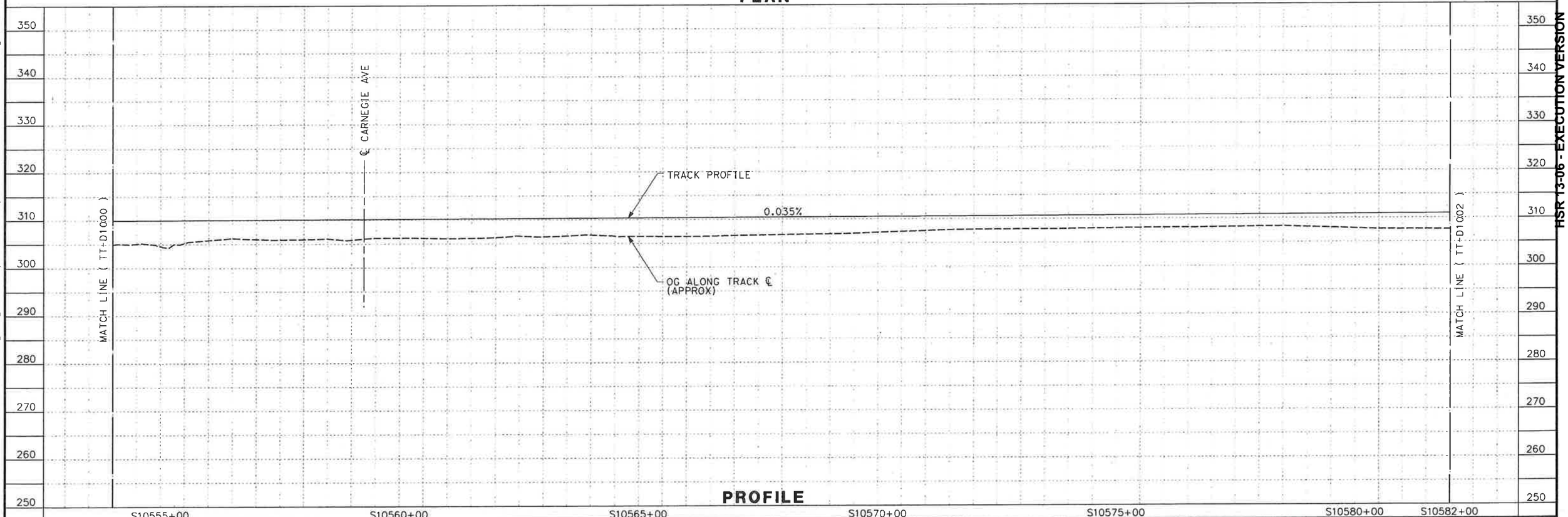

PROFILE

REV	DATE	BY	CHK	APP	DESCRIPTION

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DRAWN BY H. SULLIVAN
CHECKED BY H. PHAN
IN CHARGE A. BOONE
DATE 08/31/2011

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PAN AND PROFILE
STA. 10555+00 TO 10582+00

CONTRACT NO.
DRAWING NO. TT-D1001
SCALE AS SHOWN
SHEET NO. XX OF XX

HSR 13-06 - EXECUTION VERSION

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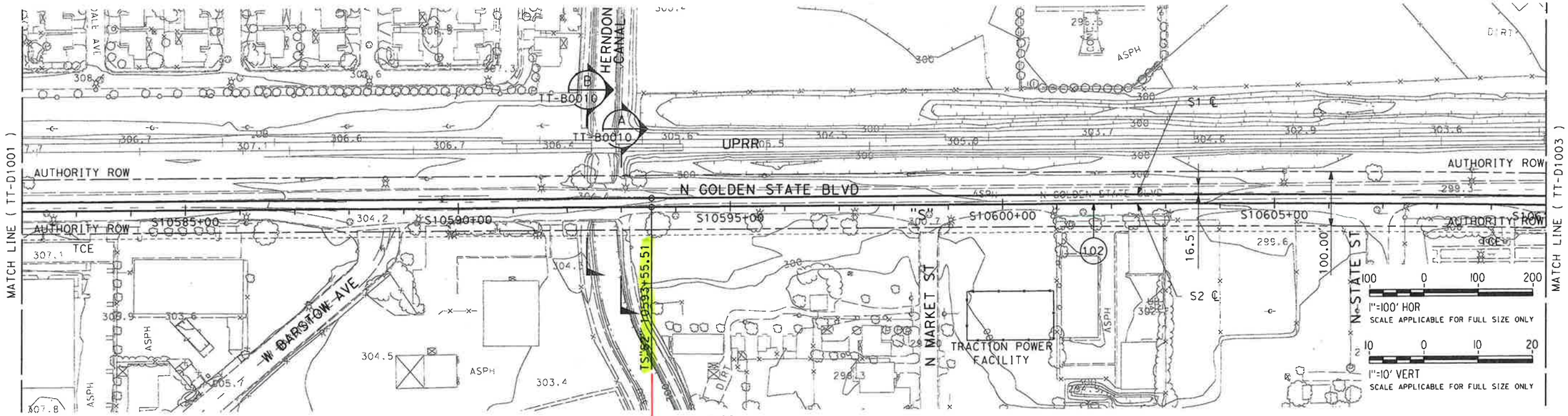

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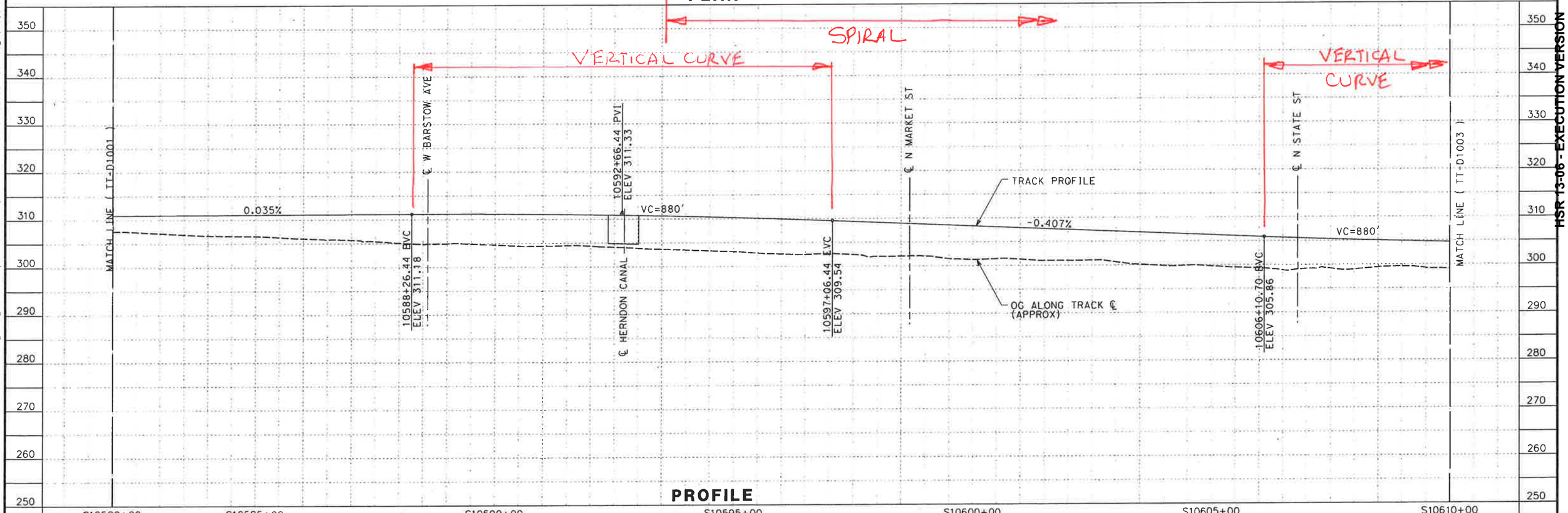

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DRAWN BY H. SULLIVAN
CHECKED BY H. PHAN
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DATE 08/31/2011

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Sacramento, CA 95811
CH2MHILL

CALIFORNIA HIGH-SPEED RAIL AUTHORITY

CALIFORNIA HIGH-SPEED TRAIN PROJECT
SIERRA SUBDIVISION
PACKAGE 1
TRACK GUIDEWAY
PLAN AND PROFILE
STA. 10582+00 TO 10610+00

CONTRACT NO.
DRAWING NO. TT-D1002
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SHEET NO. XX OF XX

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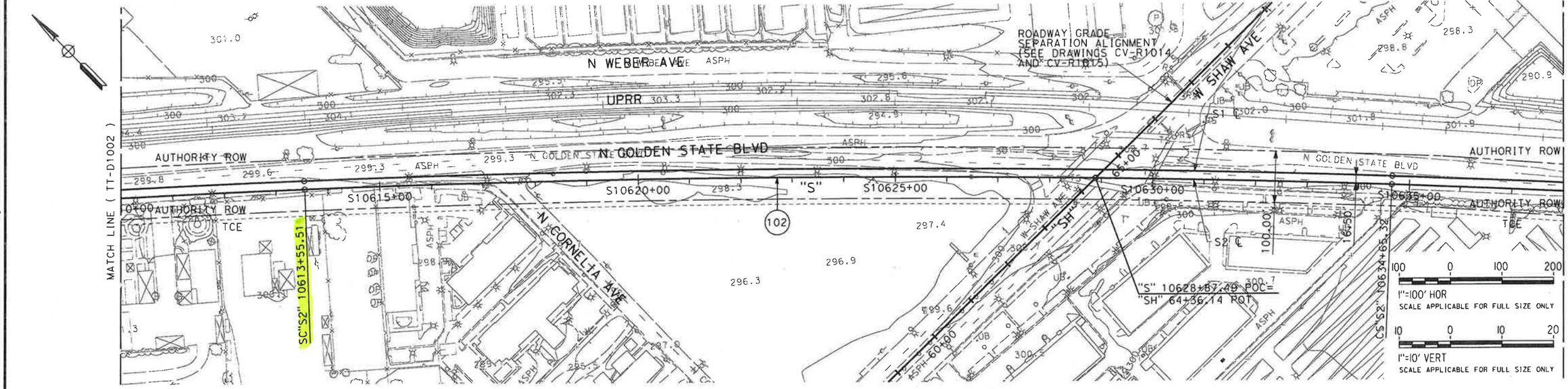

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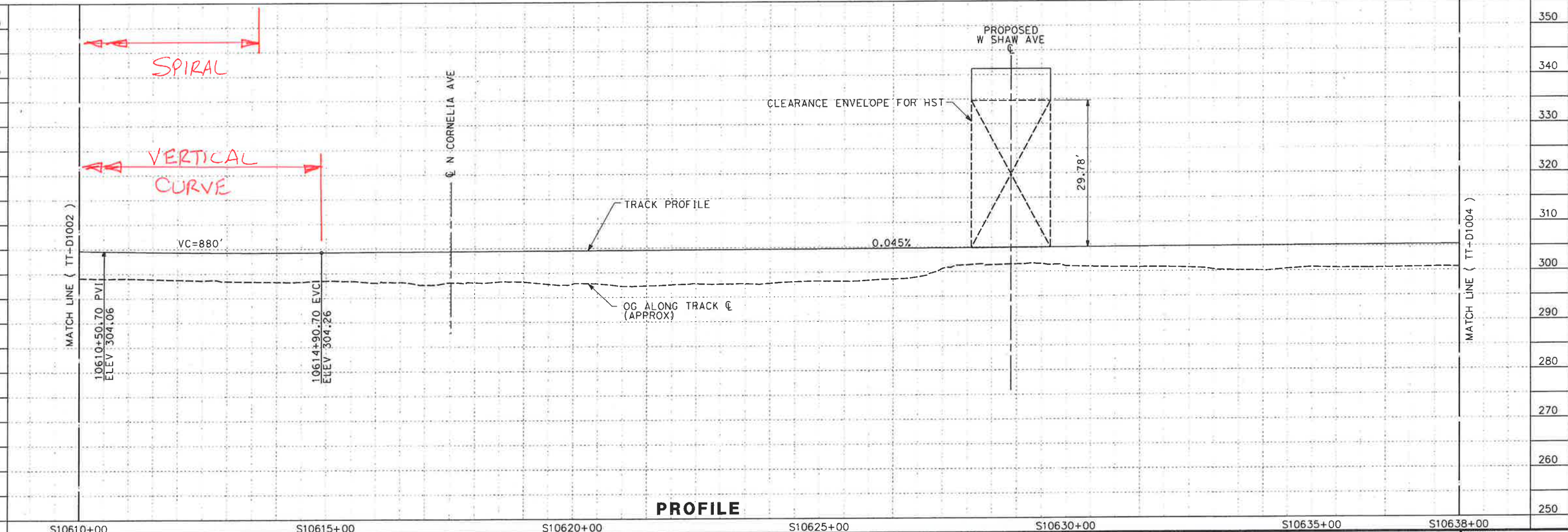

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AECOM
Technical Services, Inc.
2020 L Street, Suite 300
Sacramento, CA 95811
CH2MHILL

CALIFORNIA HIGH-SPEED RAIL AUTHORITY

CALIFORNIA HIGH-SPEED TRAIN PROJECT
SIERRA SUBDIVISION
PACKAGE 1
TRACK GUIDEWAY
PLAN AND PROFILE
STA. 10610+00 TO 10638+00

CONTRACT NO.
DRAWING NO. TT-D1003
SCALE AS SHOWN
SHEET NO. XX OF XX

HSR 13-06 - EXECUTION VERSION

MEETING SIGN - IN SHEET

SUBJECT: MF Design Variance Meeting

LOCATION: 6th Floor Main Conference Room **Date:** October 4, 2011

☑	Name		Company/Affiliation	Telephone	Signature	Cell-phone	E-mail
	CHSTP - EMT Infrastructure Subgroup						
☑	Chirco	John	PB/Infrastructure Manager	415-243-4685			chirco@pbworld.com
☑	Wightman	Chris	PB/Infrastructure	415-284-4602		415 533 4146	wightmancj@pbworld.com
	CHSTP - EMT Systems Integration Subgroup						
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	CHSTP - EMT Systems Subgroup						
☑	Schmedes	Rick	PB/Systems Manager	415-243-4621		415-259-2707	schmedes@pbworld.com
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	CHSTP - Operations & Maintenance Team						
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	Name		**Company/Affiliation**	**Telephone**	**Signature**	**Cell-phone**	**E-mail**
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☐							
☐							

PLEASE PRINT YOUR DETAILS. THANK YOU

Wightman, Christopher J.

From: Wightman, Christopher J.
Sent: Monday, October 03, 2011 3:19 PM
To: Recacho, Lyan; Chirco, John; Siu, Wai-on; Schmedes, Rick; Metzler, Joseph; Murphy, Anthony; Hsiao, Michael; Walker, Richard D.; Cameron, Craig; Valentine, Peter; Lau, John; Harris, George
Subject: M-F Design Variance Request Submittal
Attachments: M-F Design Variance Request Submittal - C.Wightman

See below items for discussion at tomorrow's DVR discussion. Please come prepared to discuss the following:

1. Confirm updated DVRs reflect new mapping
2. Confirm floodplain elevation
3. Confirm status of environmental documents
4. Cost avoidance is driver for these DVRs, show derivation of $5M, $5M, $50M, & $0.5M cost impact.
5. Discuss option of lowering HSR alignment
6. OCS considerations for lowered overhead clearance
7. 0001 - OCS Clearance under future Re-constructed W Clinton Ave Over-pass
   https://ww3.projectsolve2.com/eRoom/SFOF7/Engineering/0_c6977
   -Next action
   -Next action by
8. 0002 - OCS Clearance Under Future Veterans Blvd Overpass
   https://ww3.projectsolve2.com/eRoom/SFOF7/Engineering/0_c697e
   -Next action
   -Next action by
9. 0003 - OCS Clearance Ashlan Avenue
   https://ww3.projectsolve2.com/eRoom/SFOF7/Engineering/0_c7b3e
   -Next action
   -Next action by
10. 0004 - HST Track Alignment Spiral/Vertical Curve Overlap
    https://ww3.projectsolve2.com/eRoom/SFOF7/Engineering/0_c7b73
    -Next action
    -Next action by

Thanks

Chris

425-533-4146

Memorandum

To: John Popoff, Deputy Program Director

From: Peter Valentine, Regional Manager Merced to Fresno

Copy: Hans Van Winkle, Program Director
Ken Hartley, Richard Frankhuizen, Jeff Abercrombie

Date: September 16, 2011

Subject: CHSTP Merced to Fresno Section
Regional Manager Activities – August 2011

Throughout the month of August progress was made in wrapping up all required areas that would contribute to the publication of the Draft EIR/EIS on schedule.

Final 15% Engineering record set for the Hybrid 21 alternative is progressed on schedule. Preliminary 30% design progressed in parallel with PMT over-the-shoulder review.

Public Information Workshops were held in Merced, Madera and Fresno. Good response from general public. Comments received were logged using "CommentSense".

1) Key Developments and Accomplishments:

- 08/02, ROW meeting with Patricia Jones, AECOM, BRI and O'Dell Engineering on development of ROW appraisal plans. Key notes: -
  1. BRI/O'Dell expressed concern that final alignment may change total number of parcels
  2. BRI to issue notices to landowners 3 days in advance for BRI surveyors to conduct field work. Notices, door hangers and standard reply approved by Jeff Abercrombie
- 08/02, Discussion with AECOM and URS on UPRR ROW and alignment at Clinton. Key notes: -
  1. Latest topographic map indicated that the 15% design alignment at Roeding Park needs adjustment (3.4' towards UPRR). This would affect the MF design
  2. AECOM to setup discussion with EMT on all these issues such as tolerance of UPRR ROW, alignment and min. HSR ROW needed for retained fill and necessity and size of crash wall
- 08/03, Design Issues Workshop. Key notes: -
  1. EMT will not provide a typical design on crash wall (at least not in 30% stage) but advised to use a 3' thick wall in the design and develop a site specific design x-sections and plan showing best possible design within current available ROW and submit for EMT review/comment
  2. For design purposes assume ballasted track and allow 2.5' from TOR to structure
- 08/03, Weekly Progress Meeting. Key notes: -
  1. Progress of 30% design
     a. Need procurement task force (PTF) list of deliverables. [post note - already received]
     b. Track alignment drawings ready for OTS review on 08/08. [post note - review comment returned 08/10]
     c. RC responded to all Caltrans comments. Meeting with Caltrans 08/11

d. City of Fresno has not seen 15% plans but has been agreeable with process to date. Authority needs to process MOU w/ City of Fresno. RC can draft the MOU but needs a template on standard format
e. ROW – good progress on appraisal maps. Need additional R/W to include GSB from south bank of SJR to Herndon
f. Aerial Survey through Madera Acres began 08/08. Data should be ready middle of October

2. Budget
   a. R/W has two to three weeks backlog
   b. Engineering has 3 to 4 weeks budget remaining
   c. AECOM to forward CR justifying FY10/11 over-spend
3. Status of DEIR/S
   a. FRA signed cover sheets. Package delivered to FRA

- 08/04, AECOM/EMT/PMT meeting on 30% schedule and deliverables. Key notes: -
  1. RC briefed proposed delivery schedule of procurement package #1 engineering design is 09/30 with in-progress review by 08/31 for final package on 10/28. Weekly OTS review arranged between RC/PMT as the team progress. Sample sheets can be produced [Post notes – Draft In-progress submitted on 08/31]
- 08/08, RM completed HSR Energy Plan Survey
- 08/08, RM reviewed draft design variance submittal for Clinton and Veteran's Blvd, design baseline needs updating before review can be completed
- 08/08, Design Team Meeting with J Abercrombie (W Siu called in)
  1. To-Do Log was reviewed with URS and AECOM
  2. AECOM has scheduled meetings with Chowchilla re mitigation measures, 08/10
  3. AECOM has scheduled meetings with City of Fresno and Caltrans, 08/11
- 08/10, H van Winkle bi-weekly update meeting
  1. Draft EIR/EIS released and uploaded to HSR website
  2. Public Comment period is through 9/28/2011
  3. Public workshops will be held in late August and Public Hearings in September
  4. Meetings are scheduled with the City of Fresno re Veteran's Boulevard design and with Caltrans re SR 99 re-alignment and disposition of Caltrans review comments
- 08/10, Procurement Task Force Meeting
  1. Action Items - MF Team to follow up w/ J Chirco on the 15% comment resolution. RM confirmed that all 15% comments are closed
  2. Procurement Task Force Items
     a. 30% design specific TM's are in final or draft format posted to PS2. Special Provisions posted on PS2 - Attorney's working on boilerplate. Draft Standard and Directive Drawings are 90% complete and available on PS2
     b. Caltrans Special Provisions will be required in Caltrans Format. RC to forward sample for acceptance by EMT
     c. EMT to issue Standard Drawings and Specifications as a standalone document to be referenced on RC Plans
     d. 30% Deliverables Checklist Spreadsheet is available on PS2. MF & FB team to coordinate which special provisions each RC should provide so as to not duplicate effort
     e. No demolition plans are scheduled to be furnished by RC. PTF to clarify and return direction
     f. System integration and interface – RC's to comment on plans and suggest items of work that should be included to avoid rework or reconstruction

3. Merced to Fresno Items
    a. Design Variance – update variance request forms to reflect new mapping
    b. Mitigations - RC presented list of mitigation measures. Infrastructure related mitigation measures will be addressed in the plans. Non infrastructure related measures will be address by policy or specification
    c. Structure complex/non complex matrix will send to EMT on 08/12 [post note – already sent]

- 08/11, Coordination Meeting with City of Fresno. Key notes: -
    1. Jeff Abercrombie briefed the team on current project status and expected local entity to be part of D/B contractor ensuring local employment. PV briefed the team on overall schedule up to RFQ/RFP. FN briefed the team on current design effort and achievements
    2. City raised concern of land use underneath aerial structures. JA advised that Authority welcome idea of land use and is open for discussion
    3. Veteran Boulevard Crossing
        a. In response to question from RM, S. Mozier, City of Fresno, said that the consequences of raising the bridge height by 3' to accommodate a 27' HST clearance would be 2 years delay to environmental clearance and cost millions extra
        b. CH2MHill to liaise with Mark Thomas, utilizing the latest map base, looking for opportunity to increase OCS vertical clearance as much as possible. Mark Thomas (designer of Veteran Blvd) advised that the project has already gone through EIR/S and is ready to present to Caltrans prior to public review
    4. Utilities
        a. FN advised that within a couple of weeks a set of utility plan will be submitted to the City for comment [post note – still working on it]
        b. City advised that HSR may need to acquire land for a suitable storm water storage basin relocation due to GSB works [post note – site alternatives already identified]
- 08/11, Coordination Meeting with Caltrans District 6. Key notes: -
    1. Jeff Abercrombie briefed the team on the current project status and expected local entity to be part of D/B contractor ensuring local employment. PV briefed the team on overall schedule up to RFQ/RFP. FN briefed the team on current design effort and achievements
    2. FN advised that because of tight schedule suggested to hold routine (weekly) discussion with Caltrans. Caltrans advised because of current budget constraint it may not be possible to entertain additional work-load. Need to follow-up on progress of Caltrans/Authority MOU
    3. General discussions on designs of Shaw and Clinton. Both Caltrans and City staff suggested bike and pedestrian lane be considered in particular ADA requirements. RC will look into options but considering geographic constraints it may not be achievable
    4. Caltrans raised concern of utility arrangement and advised existence of AT&T fiber optic route along SR99. RC to note and investigate
- 08/15, 15% comments close-out, Teleconference with J Chirco/R Schmedes
    1. 75% of comments are closed with resolution; other comments are to be addressed in 30%. All comments have been accepted and signed off by AECOM PM
    2. R Schmedes suggested review of Ave 21/Hybrid TPSS package [Post note – design review arranged for 08/18 and all issues resolved]
    3. Design Variance, PV to review DVs along with new base mapping but stated that the only way to achieve 27' clearance would be depress the HSR alignment another 3ft. The existing roadway infrastructure is a limiting factor for changing bridge deck heights

4. J Chirco raised concerns about feasibility of Merced Station in particular meeting Operations and Maintenance issues. PV stated that it will be revisited when come to 30% design

- 08/16, Review of AECOM/URS interface cross-section with T Tracy and J Chirco
  1. J Chirco agreed that a 2' shift of the AECOM alignment within the 65' ROW to match the URS alignment exiting Roeding Park would be acceptable
  2. RM directed RC to make change to alignment as suggested by J Chirco
- 08/17, Weekly progress meeting with RC (PMO sat in)
  1. RW to submit formal CR for $492K (not $509K previously reported) within a week [post note – no action taken as of 08/31]
  2. Version 4 AWP request is forthcoming from PMO
  3. R/W Plans and acquisition plans to be extended sufficient to cover work included in the 30% package. RC estimates increased budget to be $350K
     a. Task 4 Budget - 22% ($660k) spent. Burn rate $200k per week
     b. Task 9 Budget - 7% ($300k) spent, Burn rate – $80K per week
  4. Progress of 30% Design (JP sat in partly)
     a. Geotechnical draft to be prepared and submitted in Sept with no field work included
     b. RC reviewed status with J Popoff. J Popoff advise RC that the presented material did not convince him that they would make the 9/30 deadline
     c. RM requested detailed sheet list. A very rough draft was presented which did not illustrate resources and % complete to give RM or J Popoff the level of comfort that RC can make the schedule
     d. Schedule – 25% completed. On schedule to be completed by 9/30
     e. Design Variances – PV explained that there was not enough information for EMT to make a variance determination. PV directed RC to assess the cost of achieving the 27' clearance vs. the existing design which achieves 24' clearance. For continuity PMT needs all 4 DV's submitted together. PMT to assist if necessary.
  5. PMO - No issue
- 08/18, Review of TPSS for Hybrid/Ave 21 Alignment with EMT/RC/PMT (W Siu attended)
  1. A Boone from AECOM presented plans that intended to address TPSS comments generated by EMT (Vinod Sibal and Michelle Paz)
  2. EMT/PMT concluded that all of the responses presented were acceptable with minor correction to the plan set. [post note – plans corrected and posted to PS2]
- 08/19, MF & FB Environmental Schedule review with B Porter (C Cameron attended)
  1. MF/FB Schedule consistency
     a. End dates for both teams (NOD/ROD) consistent
     b. Nomenclature of tasks needs to be consistent for the two teams
     c. Checkpoint C field work to be performed in September
  2. USFWS/NMFS
     a. One BA will be submitted for all three alternatives
     b. Corp/EPA will not review BA until preferred Alternative is selected
     c. Needs funding agreement with USFWS in preparation for submittal
- 08/22, Environmental Coordination Update Call
  1. Authority proposed to extend comment period by up to 15 days (to 10/13) due to impact of corrupted DVDs having been sent out with the initial distribution of documents. This extension could be an issue to overall schedule

2. R Wenzel confirmed Authority will not be billed for remedial work in response to D Leavitt's comments
3. L Nungesser said AECOM has not complied with requirement for only 6 topical areas
4. After discussion about noise demonstration models, D Leavitt said not to do now for CV while in comment period. To follow at a later date
5. KL is preparing draft letter re A3 for environmental agency. Denai concerned that it is not potentially the LEDPA. KL confirmed that AA level data only is being utilized. Dan wants farmers issues well articulated

- 08/23, Public Workshop Training Session with L Nungesser
  1. L Nungesser provided list of Q &A positions to be used at Workshops
  2. Any requests for extension will be subject to Board decision
- 08/23, RM attended Public Information workshop in Fairmead
  1. Plant Manager for Arm and Hammer supplier expressed concern that our alignment bisects their plant. Recommended he submit comments re impact to the business. Confirmed that he will do so and speak at the Public Hearing
- 08/23, H/H – Section 208.10 Meeting
  1. AECOM, URS, EMT, RMs participated
  2. 208/408 Permits Application
     a. CH2MHill raised questions on 208/408 process and asked for clarifications. It is confirmed that there is no immediate need of 208/408 issue within Construction Package 1 (CP1) and the discussion is for future reference
     b. J Chirco replied that current TMs are drafted based on the 800 miles long project. 208/408 is more environmental than technical and are geographic specific questions that should be handled case-by-case
     c. CH2MHill stated that in order to proceed with submission additional works need to be conducted and that involves budget
  3. Flood-plain Design
     a. CH2MHill asked about design parameters for flood-plain whether 100 years is adequate. CH2MHill further stated that DWR is working on a 200 years flood-plain database but the detail will not be available by 2015
     b. J Chirco advised that it is not likely that the EMT could provide guidance on this matter and understand that it might need additional budget for both EMT and RC to develop this issue further
     c. T Bernard advised that, prior to 2015, the CVFPB will accept whatever the design team may have proposed. J Chirco concurred
- 08/24, RM attended Public Information workshop in Le Grand
  1. Spoke to Manager for Azteca Milling, he requested meeting at their plant to discuss details with their engineers. He confirmed he is submitting detailed comments
- 08/24, Call with A Koby, G Van de Merwe, AECOM and URS re Schedule Revisions
  1. Schedule to be revised to extend comment period to 10/13/2011 (15 days)
  2. Adjustments to activities 7.2.6 through 7.2.9.1 were discussed and agreed
  3. Date for Board approval of Preferred Alternative in December was confirmed to be maintained
  4. Checkpoint C will need some adjustment when it is decided how to progress with Authority
- 08/24, Procurement Meeting #6
  1. Briefing was given by Becky Mincio (EMT CADD Manager) on the coordination between MF & FB

2. Reviewed deliverable sheet with both teams. MF and FB teams are tasked with coordinating special provisions, details, title sheet, cover sheet etc, updating the deliverables list
3. MF team to provide Right of Way drawings per TM 0.1.1 [Post note – PTF confirmed that ROW plans are not required for PP#1]
4. MF team to provide sample plans for informal review 8/31 as set forth on July PTF meetings. [Post note – MF team submitted 132 sheets on 08/31 for informal review]
5. Baseline Summary Report documenting contractor scope in bullet format, listing design assumptions and qualifications was requested by PTF. PTF to supply backbone document, RC's to flesh out after IP submittal.
6. Demolition to be covered by specification in CP1

- 08/24, Bi weekly call with H van Winkle
  1. Business Plan will be issued 10/3/2011
  2. The next CV bidders forum will be held 10/8/2011
  3. RM reported first Public Workshop was held in Fairmead, went well, no big issues, about 100 attendees
  4. 30% design to south of SJ River is progressing on schedule, but budget will run out by 9/23, RC needs further authorization to maintain continuity
  5. RC is proceeding with 30% design for SR 99 relocation
  6. RC is revising AWP and there is no provision for any 30% design other than the ICS
- 08/29, Environmental Coordination Update Call
  1. Selection of HMF site for MF - RM pointed out that 4 of the 5 sites were dependent upon west to east alignment decision, 2 sites work with Ave 21 only and 2 sites work with Ave 24 only. One site cannot be determined prior to ROD/NOD for M-F that does not address west to east connections
  2. Discussion and decision to send postcard mailers out re comment period extension, Rachel, Rebecca, Shay to co-ordinate
  3. DL requested AECOM and URS co-ordinate on wind/dust affects of HSR and supplement existing TMs for consistency
  4. RM raised extent of design development that could be discussed/reviewed with Caltrans or City of Fresno. JA asked AECOM to prepare Shaw Ave development as a specific example for the group to review
- 08/30, Call with A Koby and Comment Sense staff
  1. AK concerned about lack of input to system so far, expected input by now from workshops. RW advised and requested some immediate attention
- 08/30, AECOM Monthly Progress meeting
  1. Environmental Update
     a. Extended Public Hearing by 15 days to 10/13/11
     b. J Abercrombie thanked the team for the success in LeGrand re Public Information Workshop
     c. Permitting
        i. BA – NMFS & USFWS – Applications underway
        ii. 404 Application Submitted
        iii. Checkpoint C – Needs LEDPA from USACE, additional field work in September
  2. PM
     a. AWP V4 will be submitted shortly. Needs NTP ASAP
     b. Existing budget running low. July Invoice submitted. Change Request for AWP FY10/11 completed. [Post note – CR not submitted yet]

3. Station Area Planning
   a. Rick Phillips – completed thorough revised plan for Site C.
   b. Converting it into a CADD submittal
   c. Needs to verify track alignment with Operations
4. Preliminary Engineering
   a. Wrapping up 15 % TPSS with copies go to RM and EMT
   b. Utility and Geotechnical reports are being reproduced
   c. 30% - 1/3 complete, expended 1/3 budget, spending $180k / week
   d. On time for informal IP submission.
   e. All plans due 9/30 – special provisions and reports included
   f. Design Variance – in progress, anticipated mid September
   g. Caltrans – City of Fresno meetings. Design exceptions favorable. Caltrans expressed interest in taking design roll after 30% and not go to procurement
5. Right of Way update
   a. Survey – 25% complete for boundary
   b. Oct 9th BRI data due, AECOM to take from there to complete plans Oct 28th.
   c. 500K budget will be expended by mid September
6. Outreach
   d. Postcard notifications, ad in newspapers and e-blast to stakeholders

- 08/31, Weekly Meeting
  1. Version 4 AWP will be provided today. [Post note – V4 submitted but rejected by Authority]
  2. Progress update – 30% design in progress as scheduled. Overall 33% complete. A total of 132 sheets scheduled to submit OCB. [Post note - Total 132 drawings submitted 08/31]
  3. PV directed RC to continue billing R/W work to task 9 up to $500k after which R/W work will be billed to task 10 once budget is available
  4. FRA Comments - A Boone to review and provide response

2) Key Meetings Attended:

- 08/03, Design Issue Workshop
- 08/03, AECOM Team Weekly Progress Meeting
- 08/04, AECOM/EMT/PMT meeting on 30% schedule and deliverables
- 08/08, Design Team Meeting with J Abercrombie (W Siu called in)
- 08/08, Procurement Task Force Meeting with H van Winkle
- 08/10, H van Winkle bi-weekly update meeting
- 08/10, Procurement Task Force Meeting
- 08/11, HSR MF Weekly RC Meeting
- 08/11, Coordination Meeting with City of Fresno
- 08/11, Coordination Meeting with Caltrans District 6.
- 08/15, Design Team Meeting with J Abercrombie
- 08/15, 15% comments close-out, Teleconference with J Chirco/R Schmedes
- 08/17, In progress review of Design Plans
- 08/17, Weekly Progress meeting with RC
- 08/18, Review Meeting, TPSS for Hybrid/Ave 21 Alignment with EMT
- 08/19, Environmental Schedule review with B Porter.
- 08/22, Environmental Coordination Update Call

- 08/23, Weekly RM meeting with J Popoff
- 08/23, Public Workshop Training Session with L Nungesser
- 08/23, RM attended Public Information workshop in Fairmead
- 08/23, H/H – Section 208.10 Meeting
- 08/24, RM attended Public Information workshop in Le Grand
- 08/24, Call with A Koby, G Van de Merwe, AECOM and URS re Schedule Revisions
- 08/24, Procurement Meeting #6
- 08/24, Bi weekly call with H van Winkle
- 08/29, Environmental Coordination Update Call
- 08/30, Comment Sense discussion with A Koby
- 08/30, AECOM Monthly Progress meeting
- 08/31, AECOM weekly Progress Meeting

3) Documents Reviewed:

- 08/01, AECOM June Invoice
- 08/02, PMT Monthly Deliverable update
- 08/10, PMT Weekly schedule
- 08/11, Generated list of comments in preparation for comment resolution meeting
- 08/12, PMT Monthly Deliverable update
- 08/12, Update to RM's AWP
- 08/17, In progress review of Design Plans
- 08/18, Review Meeting, TPSS for Hybrid/Ave 21 Alignment with EMT
- 08/19, Review of AECOM staff changes with recommendation to Authority
- 08/22, In progress review and comment of CP1 Utility Plan
- 08/23, MF Sheet List
- 08/23, Hydrology/Hydraulics Memo from CH2M Hill
- 08/24, ICS Section Schedule & RC Schedule
- 08/25, RC 11/12 AWP Version 4 scope changes
- 08/30, FRA 15% Review Comments

4) Issues and Areas of Concern:

- New Issues:

    1. Authority decision to proceed with DEIR/EIS without A3 alternative (contrary to EPA and COE request) has been identified as a risk to schedule in the event the COE and EPA cannot be convinced by Authority that A3 elimination was appropriate
    2. Authority decided to extend the Public comment period by up to 15 days (from 9/28 to 10/13) driven by some distributed DVDs being corrupt in the M-F Section and requests for extension from public

- Continuing or Resolved (✓) Issues:

    1. Procedure for approval of Caltrans resources to support M-F 30% accelerated schedule needs to be finalized. The first ARRA section includes re-alignment of 9,000ft of SR 99 which needs significant Caltrans support/review. With requirement to complete the ARRA 30% PE by 10/28

2. UPRR response to HSR adjacency of at-grade alignment is needed to determine if proposed at-grade alignment is viable (north of Fresno and Merced Station traveling south). Absence of UPRR co-operation continues to be a MAJOR RISK to the currently proposed alignments. Some straddle bent columns will be on UPRR property for the south of SJ River crossing making this all the more critical. With requirement to complete the ARRA 30% PE by 10/28
3. Notified by RC that FY 2010 authorization had exceeded by $492,000. RC to provide details and notify Authority of situation. RM will support to gain approval for payment (presumably by CR). At 8/31, RC has still not submitted request
4. RC AWP does not include any provision for response to RFIs once the RFP for Design Build Contract has been issued. Decision is needed on who has responsibility for RFI responses
5. AECOM's LNTP Authorization of $2m for Design will be expended before the end of September. Additional Authorization is required by mid-September to maintain the 30% design schedule requirement

5) Action Items and Planned Work Next Month:

- Weekly Progress meeting with AECOM every Wednesday
- Review of AECOM schedule to ensure key activities are being met leading to ROD/NOD completion
- Attend weekly Engineering conference calls
- Attend weekly Environmental coordination conference calls
- Review comments from AECOM on FY11/12 AWP, revise, and resubmit as requested
- Attend Public Hearing in Merced 09/13. Madera 09/14 and Fresno 09/20

6) Financial Reporting:

AECOM August 2011 Monthly Progress Report received 09/16 (invoice not received yet) indicated that staff worked a total of 13,654 labor hours, which exceeded planned 13,193 by 3.5%. Expenditures were $1,596,968 which is lower than planned $1,829,490 by 14.5%.

It is anticipated that expenses of September and October would be around $1.8m each month. The $5m FY11/12 NTP#1 would be enough for the team to work until end of September.

7) Other Information:

- Nil

California High-Speed Train Project

DESIGN VARIANCE COVER SHEET

Design Variance Request Number	0003
Design Variance Request Title	OCS Clearance Ashlan Ave

Prepared by:

AECOM / CH2M HILL	10-11-11
Regional Consultant	Date

PMT Review:

Richard Schmedes	1-6-12
Systems	Date
John Chirco	12-30-11
Infrastructure	Date
Joseph Metzler	12-16-11
Operations/Maintenance/Safety	Date
Frank Banko	9-19-11
Rolling Stock	Date
Vladimir Kanevskiy	12-16-11
Regulatory Approvals	
Tony Murphy	1-10-12
System Integration	Date

PMT Recommended:

Peter Valentine	1-11-12
PMT Regional Manager	Date

PMT Approval:

Ken Jong	2-2-12
Engineering Manager	Date

Agency Concurrence:

CHSR Authority Chief Engineer	Date

HSR 13-06 - EXECUTION VERSION

CHSR Authority Chief Engineer Date

Part 1 – Design Variance Request Information

Title/Subject: OCS Clearance under future reconstructed Ashlan Avenue Overhead

Number: AECOM-SYS-0-0003 Revision: 3

Contract Name & Number (Final Design): HSR06-007

Region: Merced - Fresno

Location: Fresno County

Regional Consultant's / Third Party Design Drawing Reference:

Date Submitted to RMT & PMT

PREPARED / SUBMITTED BY: NAME: Alan Boone/Doug Fredericks COMPANY: AECOM/CH2M HILL SIGNATURE: DATE: (10-11-2011)	

*Note design variance numbers will follow the same convention: "ABC" will abbreviate the name of the firm submitting the variance, "DEF" abbreviates the name of firm receiving the variance request, "X" is the revision number starting from 0, and the last four numbers count the number of total submittals starting from one.

Part 2 – Design Variance Request Information

CHSTP DESIGN REQUIREMENT Include reference to drawings, design criteria, technical memos, specifications	TM3.2.1 – OCS requirements, Track work Flood elevation clearance
DESIGN CRITERIA REQUIRING A VARIANCE	The vertical clearance of 27 ft for installation of OCS system under new or planned over-crossing structure TOR 2.5 ft above flood elevation
REASON FOR REQUESTING VARIANCE	Any rise of profile of the new structure relative to the existing structure it replaces results in higher project impact, mitigation, delays and cost. Lowering HST will result in track work below estimated flood elevation, which may require boat-section and pump station To eliminate the requirement to lower the track work below the estimated flood elevation a variance to reduce the vertical bridge clearance to 22ft would be required
JUSTIFICATION FOR VARIANCE	To minimize the dip in the alignment under Ashlan Ave, maintain track elevation above existing ground and 2.5ft above estimated flood elevation. Achieves best possible vertical track alignment with minimum grade change, eliminates need for boat section and pumping equipment/maintenance. Provides the best track alignment profile for the least cost
PROPOSED ALTERNATIVE DESIGN REQUIREMENT	Allow minimum clearance under replacement bridge to be **22 to 24ft**, this equates to TM 3.2.1 Directive Drawing for existing bridges up to 120 ft wide with free running OCS and reduced System Depth. Use Up to 2 ft of Walls/boat section for flood protection Or Allow deeper track work construction below flood elevation, while protected by a boat-section and pump station may be needed

Part 3 – Impact Analysis

OPERATIONS	N/A
MAINTENANCE	N/A
INFRASTRUCTURE	**General** The existing overhead structure clearance over UPRR is at 23.68 ft. This overhead will be demolished and rebuilt.

	While technically the replacement bridge can be considered to be “new”, due to compatibility with other adjacent facilities that will not be replaced, the design must accommodate “existing” site conditions and profiles. Since replacing an existing structure which needs to conform to existing configurations and constraints on either side of the structure, it is proposed to consider clearance requirements for this location as those required for crossing under an existing overhead (i.e. 22 to 24 ft clearance), while maintaining flood elevation clearance with up to 2 ft of walls/boat section Raising Ashlan Ave profile to provide the 27 feet clearance over HSR will result in impacts to the approach and ramp features of Ashlan Ave and SR99 interchange, making the revisions impractical. Exhibits 1 through 5 show draft 30% design plans at Ashlan Ave. Exhibit 4 shows revised Ashlan profile grade of 6.6% to the Caltrans Ashlan/SR99 interchange ramps. This grade is already substandard, pending consideration and approval by Caltrans. Since Ashlan/SR99 interchange in its existing conditions does not meet current standards, further revisions of its configurations may lead to the requirement of replacing the interchange. Design options to consider at this location are: • Raising Ashlan Ave roadway Profile • Design Variance to reduce 27 ft clearance • Lowering HST profile with higher potential impact to flood elevation requirements • Combination of above **<u>Roadway Profile Adjustments</u>** Modifying the Ashlan Ave replacement design to raise the roadway profile further so that clearance over HST can be raised to 27 ft is not feasible due to geometric factors including the following: • Raising the profile to clear 27’ will extend the roadway profile closer to Caltrans interchange structure over SR 99. • Additional modifications of the interchange configuration will be required, including NB loop on-ramp and NB off-ramp. • These ramps in their existing conditions do not meet current standards. Further

	revisions of these ramps for HST clearance may require major improvement or replacement of the ramp to meet current standards. • Revisions to the ramp may quickly involve other substandard features of the interchange, and possible requirement to replace much of the interchange at an estimated cost of $50M. • Further rise of the profile and interchange modification will impact additional ROW. • Raising Ashlan Ave profile will impact intersection with Golden State Blvd and complicate staged construction of the new Ashlan structure in halves. • None of the additional footprint or project features associated with partial or full interchange replacement have been included in project footprint or environmental documents. Re-evaluation of these additional features will delay the project and procurement of package 1 (ARRA funded) project. **<u>Revised HSR track profile to provide 22 ft to 24 ft clearance</u>** Original HSR profile design was based on preliminary mapping. In addition, in absence of floodplain information, a conservative approach of keeping TOR 4 ft above average existing ground elevation in the vicinity was used to meet the flood elevation requirements. Current draft 30% design, as shown in Exhibit 4 is based on current mapping. It should be noted that as a result of the poor accuracy of the initial mapping (+/- 3 ft accuracy), much lower clearance was discovered when using the updated mapping. The current draft 30% design has already adjusted the roadway and HST profile to provide additional 2 ft clearance due to the initial mapping accuracy issues. Subsequent evaluation and adjustment of the 30% profile design were conducted based on : • Updated mapping (+/- 0.5 ft accuracy) • Estimated flood elevation requirement which sets the TOR at a minimum of 3 ft above existing ground elevation Based on FEMA evaluations and maps, 100 year flood event will impact regions near San Joaquin River, Herndon Canal and south of

	Clinton. Local area adjacent to Clinton Ave, is therefore subject to only localized flooding for which flood agencies use 6 inch water elevation above existing ground/Golden State Blvd.. At Ashlan crossing, existing ground is at 295 ft. Allowing for 0,5 flood elevation (i.e. elevation 295.5), TOR at 2.5 ft higher will be at minimum elevation of 298 ft. As shown in exhibits 8 and 9, the draft 30% design HST profile (in black) will have TOR below the estimated flood elevation of 295.5 ft level, for nearly 2500 ft. This is primarily due to the HST profile adjustment required due to the initial mapping accuracy/errors, and recent determination of floodplain and local jurisdiction flood elevation estimates. To meet flood protection requirements noted above the revised track profile (blue) at 298 ft will clear flood elevation requirements, while providing minimum of 22 ft clearance to the critical point on the soffit of the new Ashlan bridge. Alternatively, a 24 ft clearance will require 2 ft walls/boat section to protect against local flooding. Note TM 3.2.1 allows 22 ft clear for similar conditions for existing bridge. See Exhibit 7 for vertical clearance, and flood elevation clearance options. **Refined HSR track profile to provide 27 ft clearance** As a basis of comparison, the draft final 30% design of HSR profile was further refined to examine conditions which can increase clearance under the new Ashlan Ave structure from to standard 27 ft. As shown in calculations in Exhibit 8, and profile design plan in Exhibit 9 (Red line), this condition will result in TOR at lower elevation than the required elevation of 298 ft to clear estimated flood conditions (TOR 293 ft). In fact, TOR under this condition will be 2 ft below existing ground elevation (2.5 ft below estimated flood elevation). To provide flood protection a 2500 long wall/boat section, 5 ft deep will be required. Additionally since the lowered HST TOR and drainage system is now lower than the existing grounds, feasibility of draining HST into nearby facilities will have to be re-examined. Lowered drainage outlet may require pump station to elevate drained storm water above the local drainage inlets and basins.

Other requirements for Adjusted HST profile

For standard 27 ft clearance the potential design issues to be considered are:

- May result in more frequent profile rise and fall at constrained locations (Veterans Blvd, Ashlan, Clinton)
- Where HST tracks are below estimated flood elevation, boat-section will be needed. If available drainage facilities (i.e. inlets and basins) are above those lowered system, pump station may also be required

Drainage conditions of the boat-section will have to be refined to investigate feasibility of draining the boat-section into a nearby flood control facility. In absence of such options, design must consider implementation and operation of a pump station to pump storm water and/or local flood water from the boat-section.

The boat-section unit cost is estimated at 18.5M/mile for a 7 ft deep section ($9M for 2500 ft of 5 ft deep). Pump stations are estimated at $3 million, with equipment replacement and O&M equivalent to $300K over 20 year intervals.

Recommendation

Consider a variance of 24 ft clearance, along with flood protection walls/boat section of 2 ft in height. Flood elevations are based on local flood agency coordination, and are assumed to be 6 inches above existing Golden State Boulevard surface (existing ground) .

Justification

Without raising the Ashlan Ave profile which has the potential to impact the SR99 interchange, refinement of the current draft 30% HST profile design provide the following options:

1. With an approved DVR, consider 24 ft clearance, as permitted for crossing under existing structures, since the existing constraints bounding the replaced Ashlan Ave overhead are prohibitive from further adjusting the roadway profile. Provide 2 ft tall walls/boat section to protect against local flooding.

<table>
<tr><td>RAILROAD SYSTEMS</td><td>N/A</td></tr>
<tr><td>RELIABILITY / FUNCTIONALITY</td><td>N/A</td></tr>
<tr><td>THIRD PARTY (Utility, Freight, Caltrans, RR, other)</td><td>Raising Ashlan Ave profile will require coordination and approval by Caltrans on resulting impacts to the SR99 interchange

Drainage of the boat-section storm water and flood water require coordination with local flood protection agencies</td></tr>
<tr><td>SAFETY AND SECURITY</td><td>N/A</td></tr>
<tr><td>DIRECT COST</td><td>
<table>
<tr><th colspan="2">Raising Ashlan Roadway profile and revising Interchange *</th></tr>
<tr><td>Interchange modification</td><td>$50M+/-</td></tr>
<tr><td>Other</td><td>Cost associated with additional engineering, environmental and delays</td></tr>
<tr><td colspan="2">* assume profile raised so there is no boat section</td></tr>
</table>
<table>
<tr><th>22 ft Clearance DVR</th></tr>
<tr><td>No Wall/Boat section
No pump station
No additional cost</td></tr>
</table>
<table>
<tr><th colspan="2">RECOMMENDED OPTION
24 ft Clearance, No DVR + 2ft wall/boat-section and pump station*</th></tr>
<tr><td>Wall/Boat Section</td><td>$8M (2 ft deep)</td></tr>
<tr><td>Pump equipment</td><td>$0.5M</td></tr>
<tr><td>Pump Station & facility</td><td>$2.5 Million</td></tr>
<tr><td>Reoccurring pump replacement cost</td><td>$300 K/20 years</td></tr>
<tr><td>Other</td><td>General maintenance</td></tr>
<tr><td colspan="2">* Pump station will be needed if lowered HST drainage cannot be drained into existing drainage facilities</td></tr>
</table>
<table>
<tr><th colspan="2">27 ft Clearance, No DVR + 5ft boat-section and pump station*</th></tr>
<tr><td>Wall/Boat Section</td><td>$9M (5 ft deep)</td></tr>
<tr><td>Pump equipment</td><td>$0.5M</td></tr>
<tr><td>Pump Station & facility</td><td>$2.5 Million</td></tr>
<tr><td>Reoccurring pump replacement cost</td><td>$300 K/20 years</td></tr>
<tr><td>Other</td><td>General maintenance</td></tr>
<tr><td colspan="2">* Pump station will be needed if lowered HST drainage cannot be drained into existing drainage facilities</td></tr>
</table>
</td></tr>
</table>

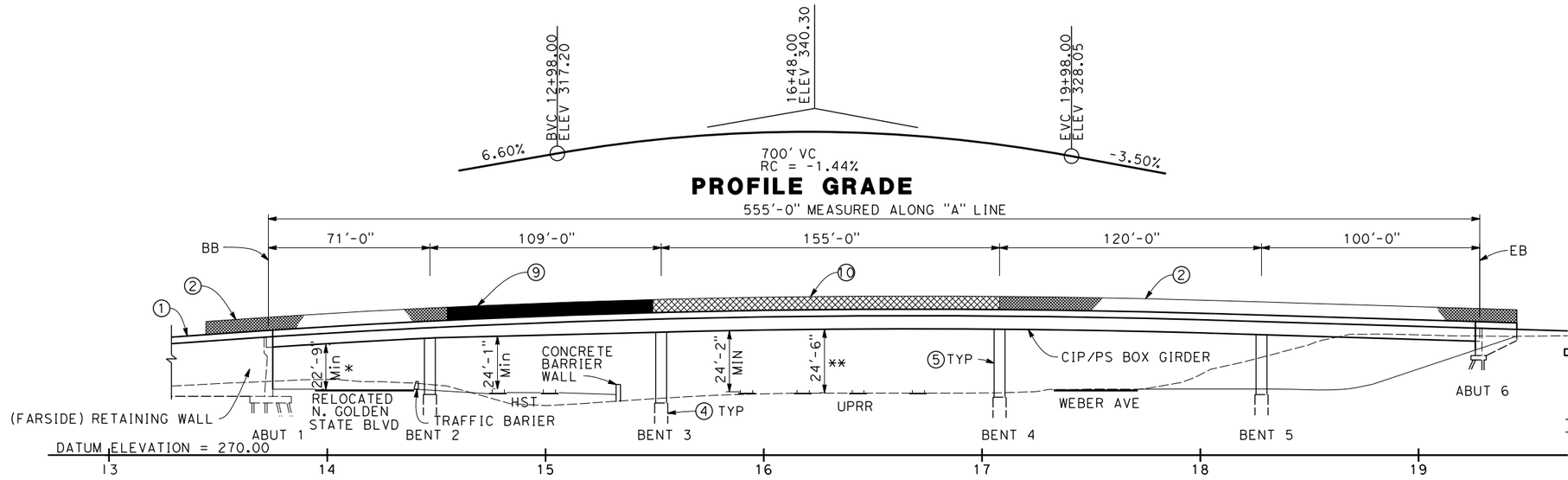
OTHER	Raising the profile of the roadway will result in change of project footprint, additional ROW impact, environmental and engineering effort, delays in environmental, design as well as procurement package 1 (ARRA)

Part 4 – Mitigation Measures

Part 5 – List of Supporting Documentation to Design Variance Request

ANALYSIS	See discussion above, attached exhibits, and draft 30% design plans.
PUBLICATION/STANDARDS EXTRACTS	N/A
RISK ASSESSMENT	N/A
DRAWINGS	See Exhibits 1 thru 7, and 9
CALCULATIONS	See Exhibit 8 for recommended option
EXPERT TESTIMONIALS	N/A
CORRESPONDENCE	N/A
OTHER	

Do not attach superfluous materials, such as complete project plan sets or engineering reports unless specifically requested.



PROFILE GRADE

ELEVATION

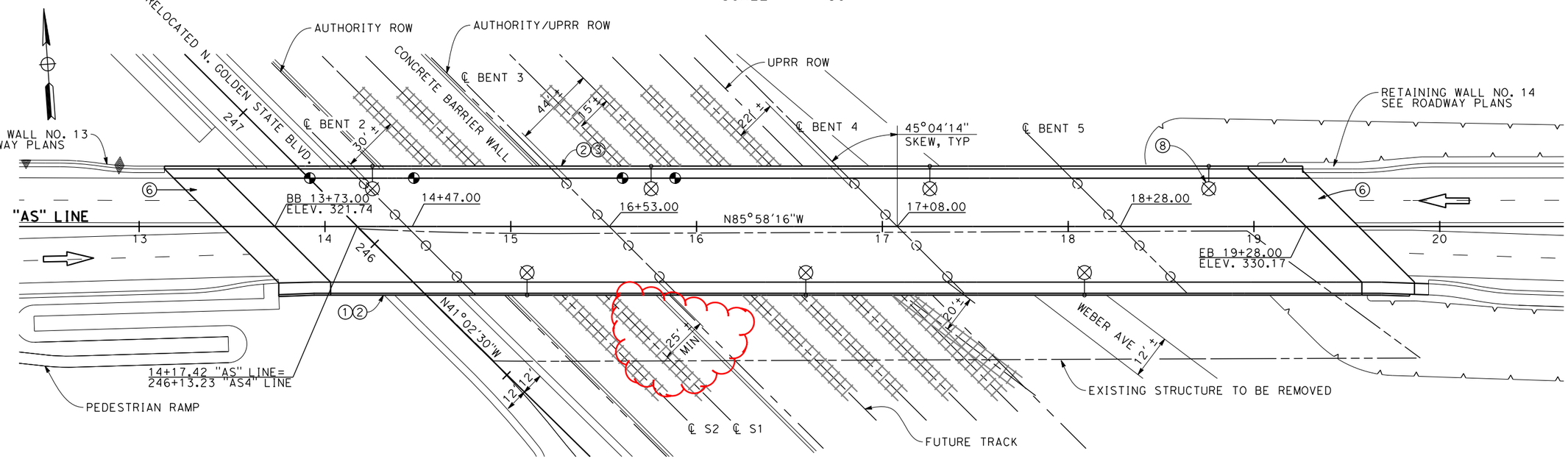
SCALE: 1" = 30'

NOTES:

1. CONCRETE BARRIER (TYPE 26 MODIFIED)
2. CHAIN LINK RAILING (TYPE 7 MODIFIED)
3. CONCRETE BARRIER (TYPE 736 MODIFIED)
4. 6'-0" DIA CIDH PILE
5. 5'-6" DIA COLUMN
6. STRUCTURE APPROACH, TYPE N(30S)
7. EXISTING UPRR ROW TO BE CONFIRMED ON SITE
8. ELECTROLIERS
9. AR FENCE WITH SOLID PLATE
10. AR FENCE

LEGEND:

- INDICATES DIRECTION OF TRAFFIC
- INDICATES APPROXIMATE POINT OF MINIMUM VERTICAL CLEARANCE
- INDICATES RAILROAD AND HIGH-SPEED TRAIN TRACK
- * TEMPORARY FALSEWORK CLEARANCE = 20'-10" FALSEWORK DEPTH = 1'-10 1/2"
- ** TEMPORARY FALSEWORK CLEARANCE = 21'-2" FALSEWORK DEPTH = 3'-5"



PLAN

SCALE: 1" = 30'

ASHLAND AVE. Exhibit 1

REV	DATE	BY	CHK	APP	DESCRIPTION

DESIGNED BY: D. FREDERICKS
DRAWN BY: P. WALKER
CHECKED BY: H. STRANDGAARD
IN CHARGE: F. NOBARI
DATE: 12/08/11

PROPOSED PRELIMINARY DESIGN

NOT FOR CONSTRUCTION

AECOM Technical Services, Inc.
2020 L Street, Suite 300
Sacramento, CA 95811
CH2MHILL

CALIFORNIA HIGH-SPEED RAIL AUTHORITY

CALIFORNIA HIGH-SPEED TRAIN PROJECT
MERCED TO FRESNO
PACKAGE 1A
ROADWAY
ASHLAN OVERHEAD
GENERAL PLAN

CONTRACT NO.
DRAWING NO. ST-11008
SCALE AS SHOWN
SHEET NO.

HSR 13-06 - EXECUTION VERSION

CURVE DATA

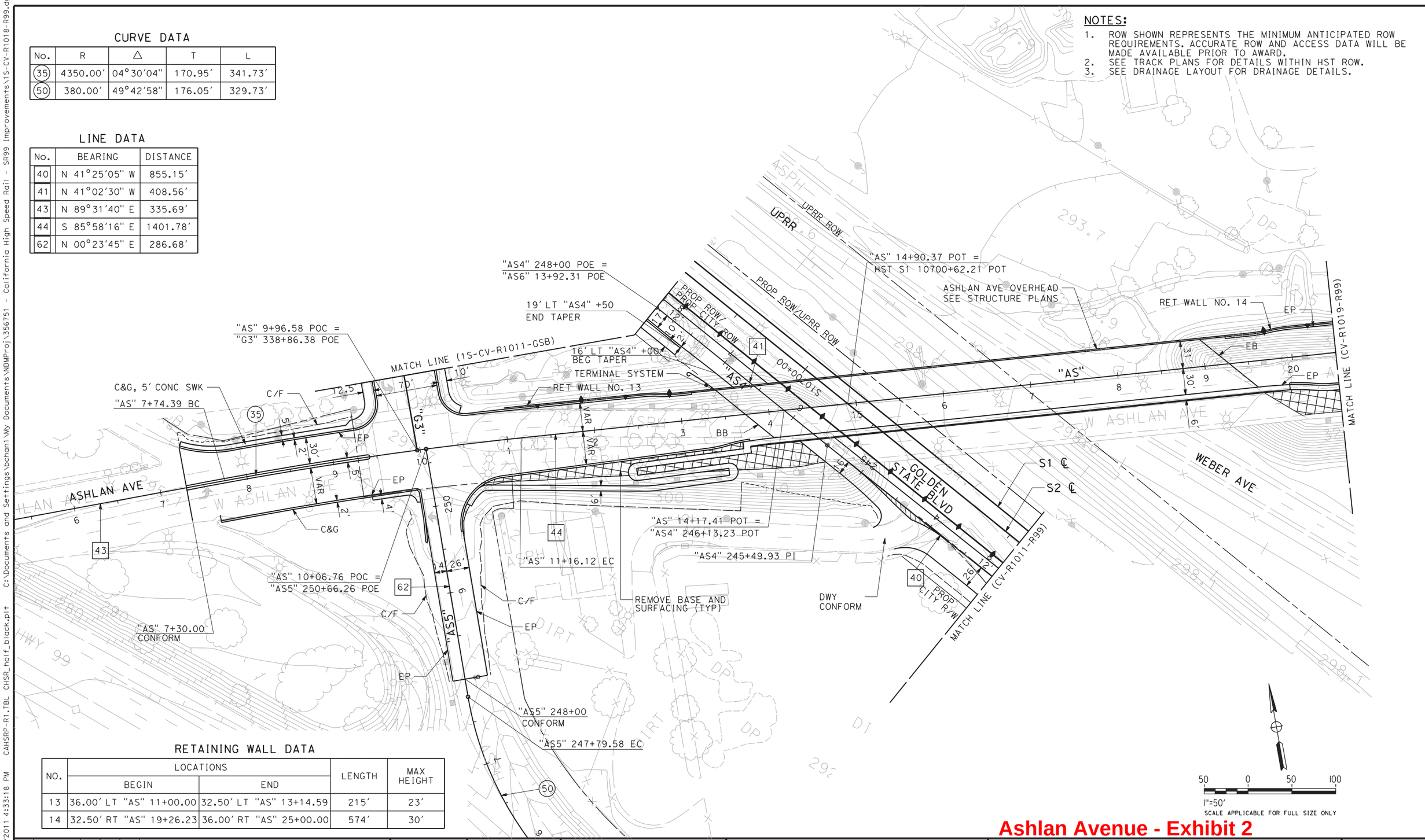
No.	R	Δ	T	L
(35)	4350.00′	04°30′04"	170.95′	341.73′
(50)	380.00′	49°42′58"	176.05′	329.73′

LINE DATA

No.	BEARING	DISTANCE
40	N 41°25′05" W	855.15′
41	N 41°02′30" W	408.56′
43	N 89°31′40" E	335.69′
44	S 85°58′16" E	1401.78′
62	N 00°23′45" E	286.68′

NOTES:

1. ROW SHOWN REPRESENTS THE MINIMUM ANTICIPATED ROW REQUIREMENTS. ACCURATE ROW AND ACCESS DATA WILL BE MADE AVAILABLE PRIOR TO AWARD.
2. SEE TRACK PLANS FOR DETAILS WITHIN HST ROW.
3. SEE DRAINAGE LAYOUT FOR DRAINAGE DETAILS.



50 0 50 100
1"=50′
SCALE APPLICABLE FOR FULL SIZE ONLY

RETAINING WALL DATA

NO.	LOCATIONS		LENGTH	MAX HEIGHT
	BEGIN	END		
13	36.00′ LT "AS" 11+00.00	32.50′ LT "AS" 13+14.59	215′	23′
14	32.50′ RT "AS" 19+26.23	36.00′ RT "AS" 25+00.00	574′	30′

Ashlan Avenue - Exhibit 2

REV	DATE	BY	CHK	APP	DESCRIPTION
A	##/##/##	XX	XX	XX	

DESIGNED BY G. MANOREK
DRAWN BY R. MITRY
CHECKED BY L. HEUSTON
IN CHARGE F. NOBARI
DATE 09/30/2011

PROPOSED PRELIMINARY DESIGN

NOT FOR CONSTRUCTION

AECOM
Technical Services, Inc.
2020 L Street, Suite 300
Sacramento, CA 95811
CH2MHILL

CALIFORNIA HIGH-SPEED RAIL AUTHORITY

CALIFORNIA HIGH-SPEED TRAIN PROJECT
SIERRA SUBDIVISION
PACKAGE 1
ROADWAY
LAYOUTS
SR 99 RE-ALIGNMENT

CONTRACT NO.
DRAWING NO. CV-R1018-R99
SCALE AS SHOWN
SHEET NO.

CURVE DATA

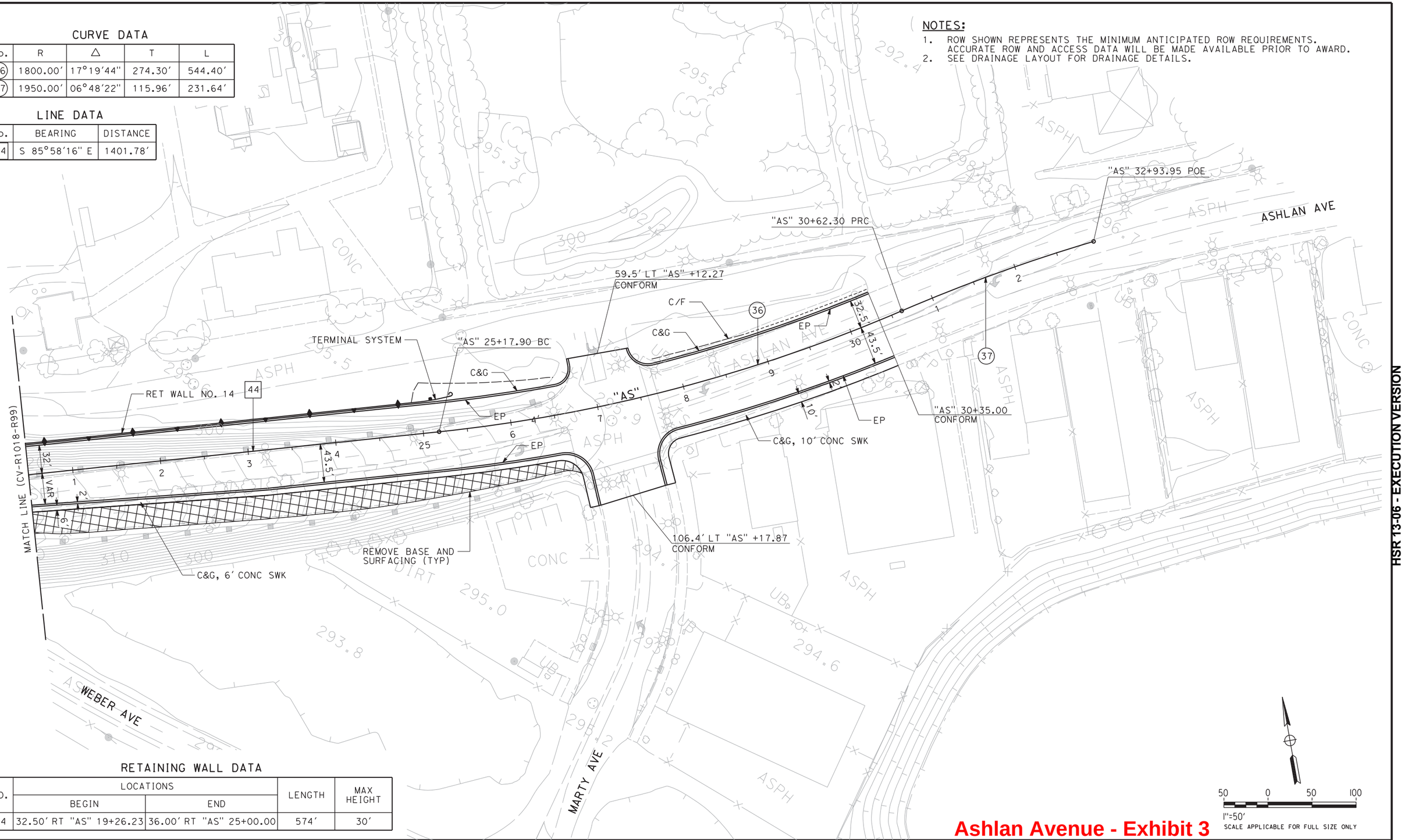
No.	R	Δ	T	L
(36)	1800.00′	17°19′44"	274.30′	544.40′
(37)	1950.00′	06°48′22"	115.96′	231.64′

LINE DATA

No.	BEARING	DISTANCE
44	S 85°58′16" E	1401.78′

NOTES:

1. ROW SHOWN REPRESENTS THE MINIMUM ANTICIPATED ROW REQUIREMENTS. ACCURATE ROW AND ACCESS DATA WILL BE MADE AVAILABLE PRIOR TO AWARD.
2. SEE DRAINAGE LAYOUT FOR DRAINAGE DETAILS.



RETAINING WALL DATA

NO.	LOCATIONS		LENGTH	MAX HEIGHT
	BEGIN	END		
14	32.50′ RT "AS" 19+26.23	36.00′ RT "AS" 25+00.00	574′	30′

Ashlan Avenue - Exhibit 3

REV	DATE	BY	CHK	APP	DESCRIPTION
A	##/##/##	XX	XX	XX	

DESIGNED BY G. MANOREK
DRAWN BY R. MITRY
CHECKED BY L. HEUSTON
IN CHARGE F. NOBARI
DATE 09/30/2011

PROPOSED PRELIMINARY DESIGN

NOT FOR CONSTRUCTION

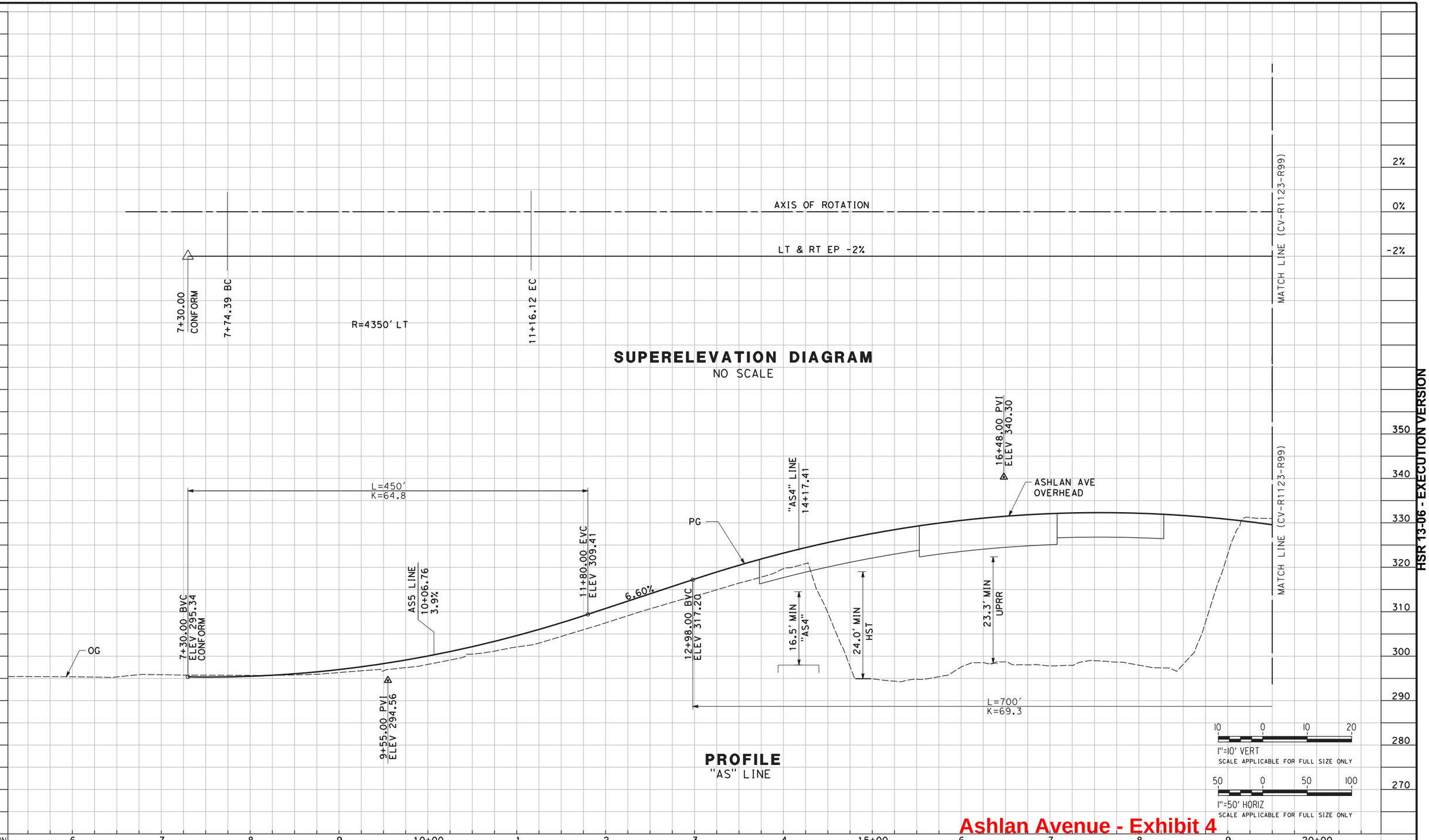
AECOM Technical Services, Inc.
2020 L Street, Suite 300
Sacramento, CA 95811

CH2MHILL

CALIFORNIA HIGH-SPEED RAIL AUTHORITY

CALIFORNIA HIGH-SPEED TRAIN PROJECT
SIERRA SUBDIVISION
PACKAGE 1
ROADWAY
LAYOUTS
SR 99 RE-ALIGNMENT

CONTRACT NO.
DRAWING NO. CV-R1019-R99
SCALE AS SHOWN
SHEET NO.



SUPERELEVATION DIAGRAM
NO SCALE

PROFILE
"AS" LINE

10 0 10 20
1"=10' VERT
SCALE APPLICABLE FOR FULL SIZE ONLY

50 0 50 100
1"=50' HORIZ
SCALE APPLICABLE FOR FULL SIZE ONLY

Ashlan Avenue - Exhibit 4

HSR 13-06 - EXECUTION VERSION

REV	DATE	BY	CHK	APP	DESCRIPTION
A	##/##/##	XX	XX	XX	

DESIGNED BY G. MANOREK
DRAWN BY B. CHAN
CHECKED BY L. HEUSTON
IN CHARGE F. NOBARI
DATE 09/30/2011

PROPOSED PRELIMINARY DESIGN

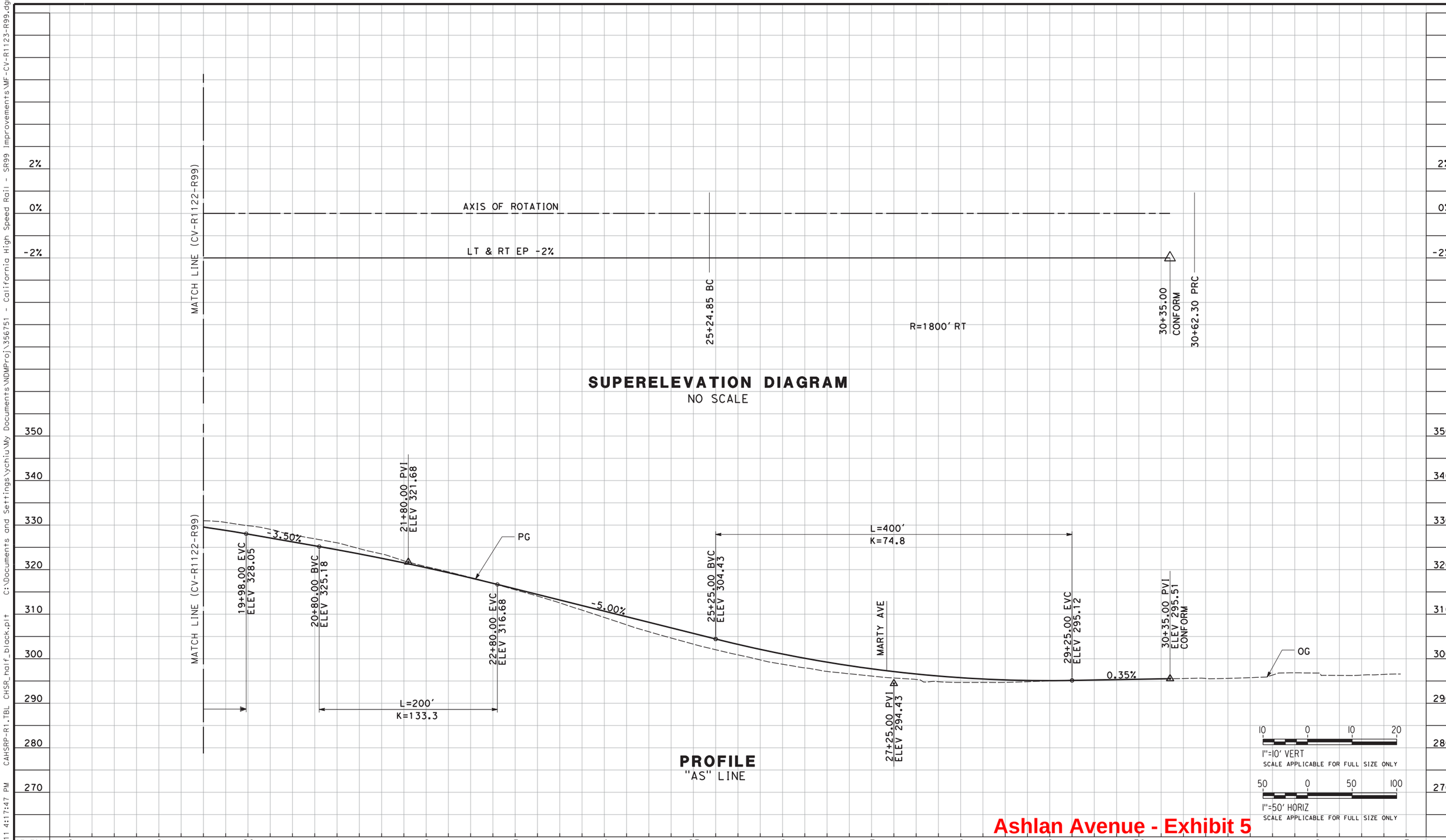
NOT FOR CONSTRUCTION

AECOM
Technical Services, Inc.
2020 L Street, Suite 300
Sacramento, CA 95811
CH2MHILL

CALIFORNIA HIGH-SPEED RAIL AUTHORITY

CALIFORNIA HIGH-SPEED TRAIN PROJECT
SIERRA SUBDIVISION
PACKAGE 1
ROADWAY
PROFILE AND SUPERELEVATION
SR 99 RE-ALIGNMENT

CONTRACT NO.
DRAWING NO. CV-R1122-R99
SCALE AS SHOWN
SHEET NO.



SUPERELEVATION DIAGRAM
NO SCALE

PROFILE
"AS" LINE

10 0 10 20
1"=10' VERT
SCALE APPLICABLE FOR FULL SIZE ONLY

50 0 50 100
1"=50' HORIZ
SCALE APPLICABLE FOR FULL SIZE ONLY

Ashlan Avenue - Exhibit 5

HSR 13-06 - EXECUTION VERSION

REV	DATE	BY	CHK	APP	DESCRIPTION
A	##/##/##	XX	XX	XX	

DESIGNED BY G. MANOREK
DRAWN BY B. CHAN
CHECKED BY L. HEUSTON
IN CHARGE F. NOBARI
DATE 09/30/2011

PROPOSED PRELIMINARY DESIGN

NOT FOR CONSTRUCTION

AECOM Technical Services, Inc.
2020 L Street, Suite 300
Sacramento, CA 95811

CH2MHILL

CALIFORNIA HIGH-SPEED RAIL AUTHORITY

CALIFORNIA HIGH-SPEED TRAIN PROJECT
SIERRA SUBDIVISION
PACKAGE 1
ROADWAY
PROFILE AND SUPERELEVATION
SR 99 RE-ALIGNMENT

CONTRACT NO.
DRAWING NO. CV-R1123-R99
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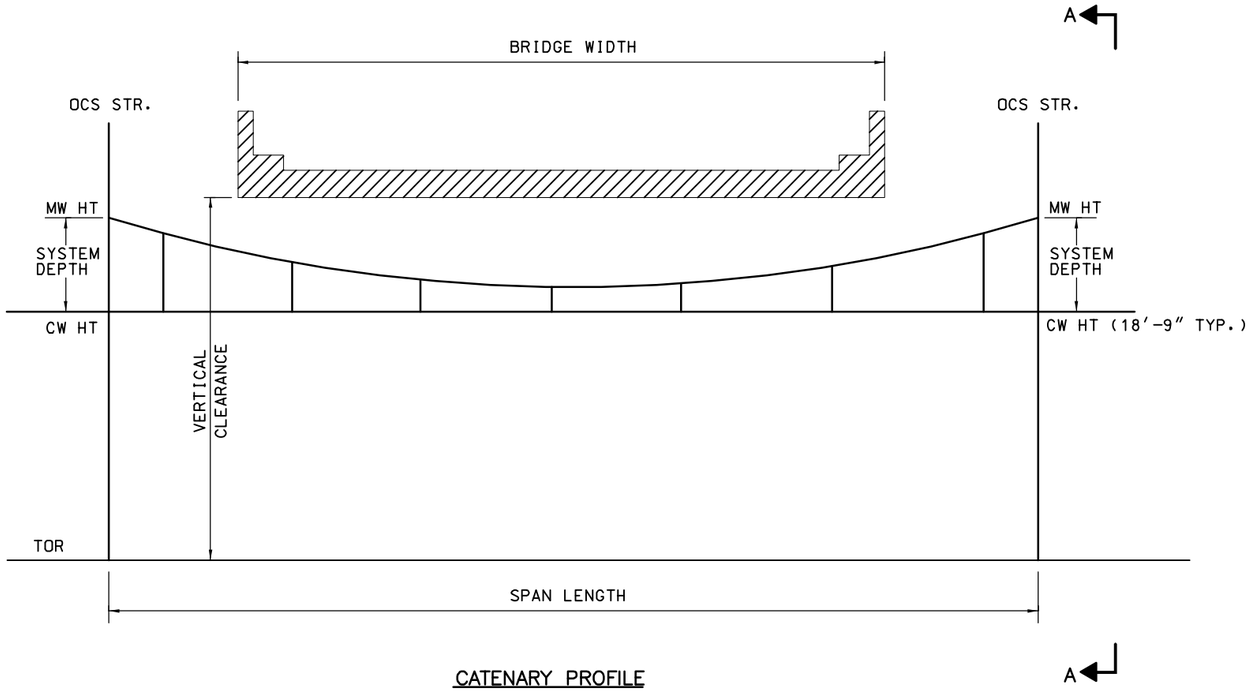
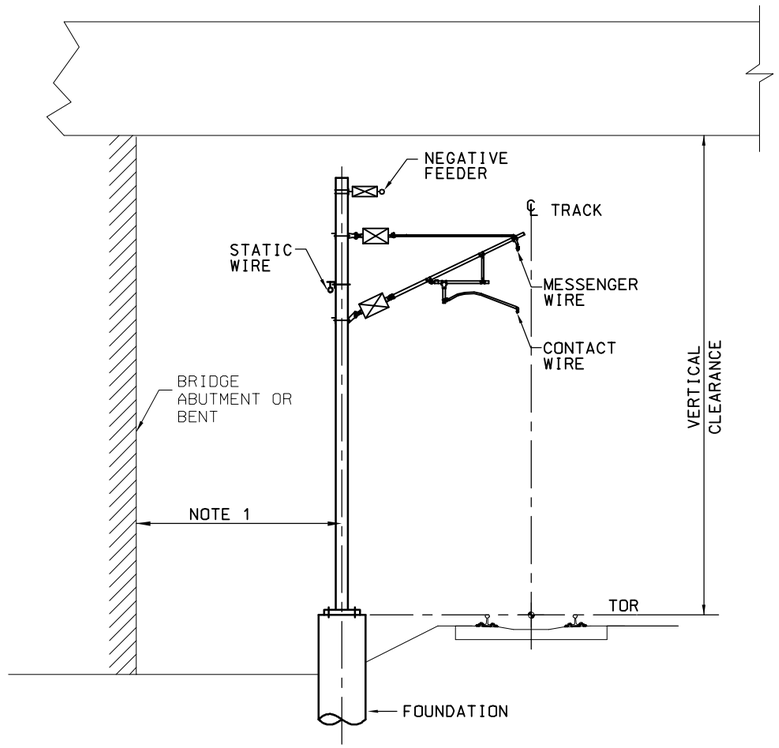
SHEET NO.



CATENARY PROFILE



VIEW A–A

MINIMUM VERTICAL CLEARANCE FOR SPEED UP TO 125 MPH					
CONDITIONS	NO BRIDGE ATTACHMENT				BRIDGE ATTACHMENT ALLOWED
	NEW BRIDGE	EXISTING BRIDGE	EXISTING BRIDGE	EXISTING BRIDGE	EXISTING BRIDGE
MAXIMUM BRIDGE WIDTH	200′	200′	120′	50′	–
OCS SPAN LENGTH	210′	210′	210′	210′	60′
OCS FREE RUNNING WITH FULL SYSTEM DEPTH (4′–0″) VERTICAL HEIGHT REQ′D	27′–0″	24′–0″	23′–0″	22′–6″	–
OCS FREE RUNNING WITH REDUCED SYSTEM DEPTH (3′–0″) VERTICAL HEIGHT REQ′D	–	23′–0″	22′–0″	21′–6″	–
OCS FREE RUNNING WITH REDUCED SYSTEM DEPTH (1′–0″) VERTICAL HEIGHT REQ′D	–	–	–	–	21′–6″

NOTES:

1. WHEN THE VERTICAL CLEARANCE IS LESS THAN 27′, NEGATIVE FEEDER CABLE SHALL BE INSTALLED ON THE FIELD SIDE OF THE POLE. IN THAT CASE, THE MINIMUM CLEARANCE 7′–6″ FROM THE CENTER OF THE POLE TO THE BRIDGE ABUTMENT OR BENT SHALL BE MAINTAINED.
2. THESE CLEARANCES ARE BASED ON CuMg05 AC–150 CONTACT WIRE WITH 4,500LB TENSION AND 300 KCMIL MESSENGER WIRE WITH 5,000LB TENSION. THE VERTICAL CLEARANCE MIGHT BE ADJUSTED BASED ON THE FINAL WIRE TENSIONS AND MATERIALS.

Exhibit 6 - From TM 3.2.1/ OCS clearance options

HSR 13-06 - EXECUTION VERSION

$FILE$ $TIME$ $DATE$ $USER$

REV	DATE	BY	CHK	APP	DESCRIPTION

DESIGNED BY M. HSIAO
DRAWN BY J. LAU
CHECKED BY R. SCHMEDES
IN CHARGE K. JONG
DATE OCT. 2010

PB PARSONS BRINCKERHOFF

CALIFORNIA HIGH-SPEED RAIL AUTHORITY
FLY CALIFORNIA
Without ever leaving the ground.

CALIFORNIA HIGH-SPEED TRAIN PROJECT
OVERHEAD CONTACT SYSTEM
DIRECTIVE DRAWING
TYPICAL CATERARY FREE RUNNING CHART FOR OVERHEAD BRIDGE SPEED UP TO 125 MPH

CONTRACT NO.
DRAWING NO. TM 3.2.1-U
SCALE NTS
SHEET NO.

Exhibit 7 – Section Clearance Options

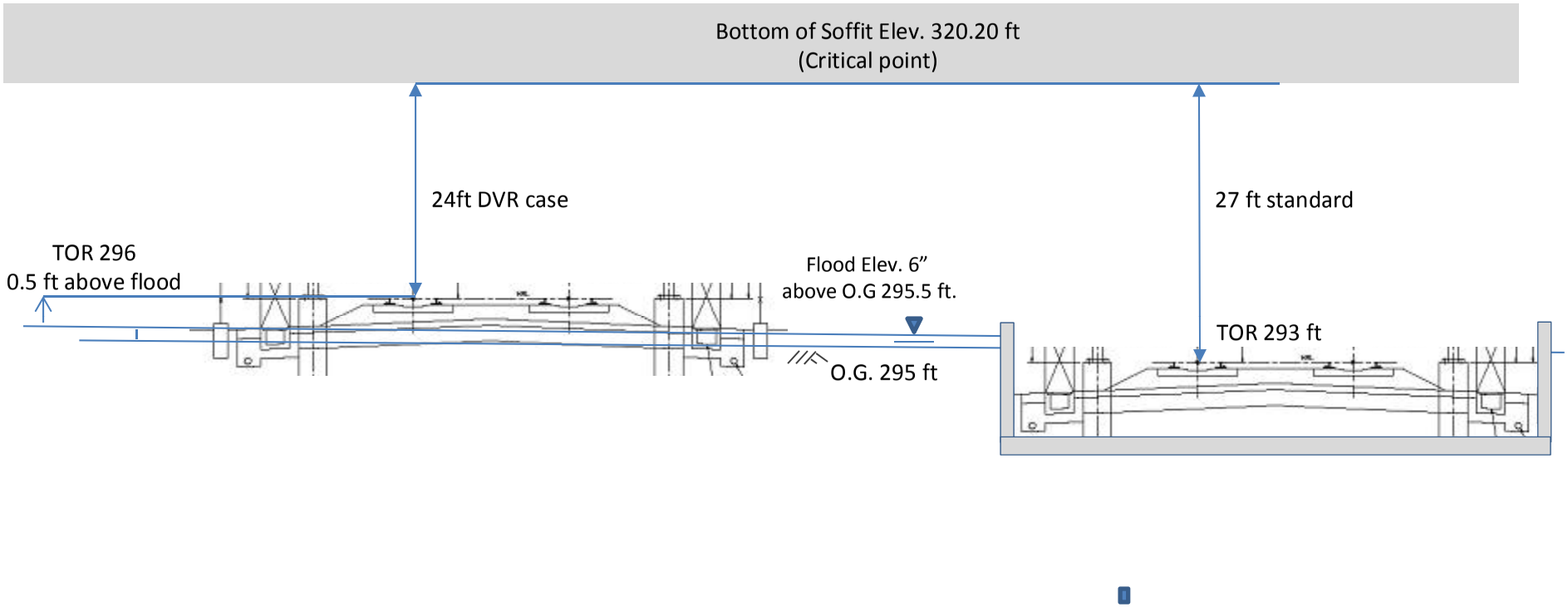
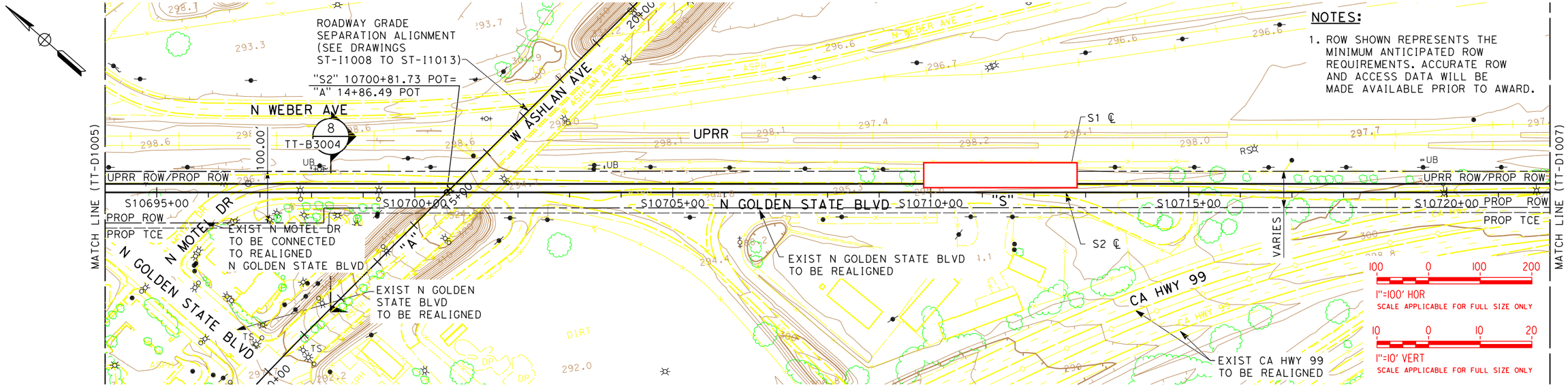


Exhibit 8

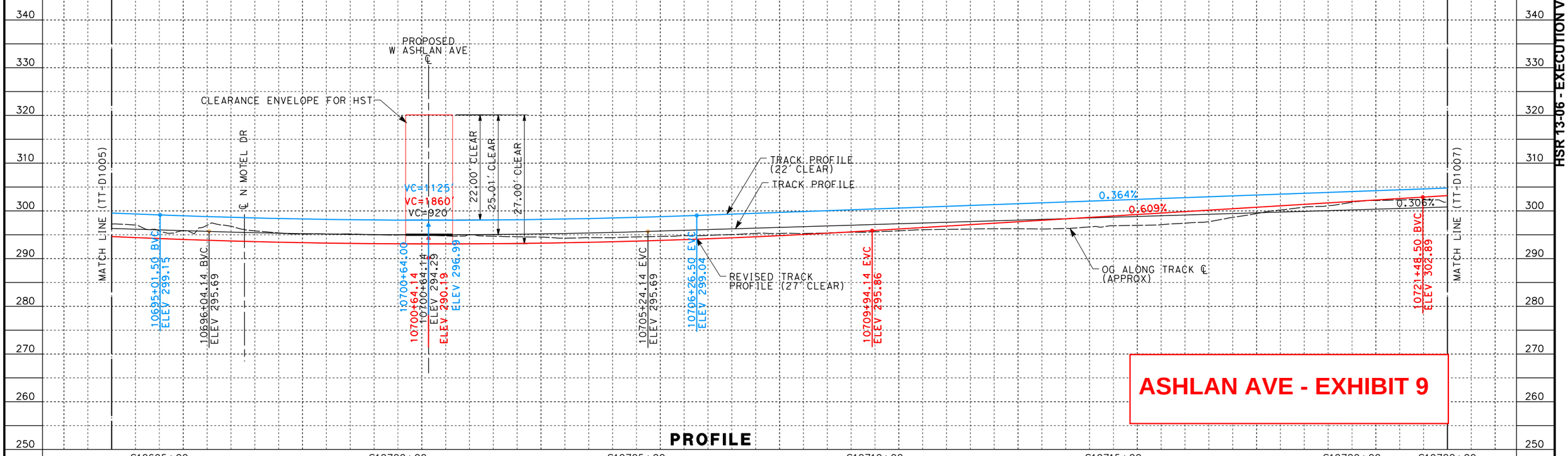
24 ft Min Vertical Clearance (Recommended)

ASHLAN BLVD					
Structure Depth =	5.14'	(@ SB Track)			
Structure Depth =	5.46'	(@ NB Track)			
Clearance Check Locations:	STA ("AS")	CL ELEV	Offset	EP ELEV	Soffit ELEV
A - NB Track	14+81.17	326.87	32.50	326.22	320.76
B - NB Track	15+50.80	329.27	37.00	328.53	323.07
C - SB Track	14+57.81	325.90	32.50	325.25	320.11
D - SB Track	15+27.45	328.54	37.00	327.80	322.66

Clearance Check Locations:	STA ("S1" or "S	TOR ELEV	Vert Clr (Soffit - TOR)	
A - NB Track	10700+32.73	296.00	**24.76**	
B - NB Track	10701+31.12	296.01	**27.06**	
C - SB Track	10700+16.20	296.00	**24.11**	Min
D - SB Track	10701+14.59	296.00	**26.66**	



PLAN



PROFILE

ASHLAN AVE - EXHIBIT 9

REV	DATE	BY	CHK	APP	DESCRIPTION

DESIGNED BY A. SHIELDS
DRAWN BY H. SULLIVAN
CHECKED BY A. BOONE
IN CHARGE A. BOONE
DATE 10/10/2011

PROPOSED PRELIMINARY DESIGN

NOT FOR CONSTRUCTION

AECOM Technical Services, Inc.
2020 L Street, Suite 300
Sacramento, CA 95811
CH2MHILL

CALIFORNIA HIGH-SPEED RAIL AUTHORITY

CALIFORNIA HIGH-SPEED TRAIN PROJECT
SIERRA SUBDIVISION
PACKAGE 1
TRACK GUIDEWAY
PLAN AND PROFILE
STA. 10694+00 TO 10722+00

CONTRACT NO.
DRAWING NO. TT-D1006
SCALE AS SHOWN
SHEET NO.

HSR 13-06 - EXECUTION VERSION

$FILE$ $PLTDRVS$ $PENTBLS$ $TIME$ $DATE$ $USER$

California High-Speed Train Project

DESIGN VARIANCE COVER SHEET

Design Variance Request Number	0001
Design Variance Request Title	OCS Clearance Under Future Re-constructed Fresno Yard Overhead (West Clinton Ave)

Prepared by:

AECOM / CH2M HILL	10-11-11
Regional Consultant	Date

PMT Review:

Richard Schmedes	1-6-12
Systems	Date
John Chirco	12-22-11
Infrastructure	Date
Joseph Metzler	12-22-11
Operations/Maintenance/Safety	Date
Frank Banko	7-26-11
Rolling Stock	Date
Vladimir Kanevskiy	11-4-11
Regulatory Approvals	
Tony Murphy	1-9-12
System Integration	Date

PMT Recommended:

Peter Valentine	1-11-12
PMT Regional Manager	Date

PMT Approval:

Ken Jong	2-2-12
Engineering Manager	Date

Agency Concurrence:

CHSR Authority Chief Engineer	Date

Part 1 – Design Variance Request Information

Title/Subject: OCS Clearance under future re-constructed Fresno Yard Overhead (W Clinton Ave)

Number: AECOM-SYS-0-0001 Revision: 3

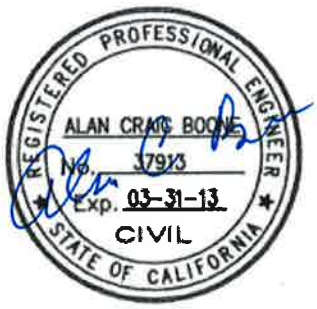
Contract Name & Number (Final Design): HSR06-007

Region: Merced - Fresno

Location: Fresno County

Regional Consultant's / Third Party Design Drawing Reference:

Date Submitted to RMT & PMT

PREPARED / SUBMITTED BY: NAME: Alan Boone/Doug Fredericks COMPANY: AECOM/CH2M HILL SIGNATURE: DATE: (10-11-2011)	

*Note design variance numbers will follow the same convention: "ABC" will abbreviate the name of the firm submitting the variance, "DEF" abbreviates the name of firm receiving the variance request, "X" is the revision number starting from 0, and the last four numbers count the number of total submittals starting from one.

Part 2 – Design Variance Request Information

CHSTP DESIGN REQUIREMENT Include reference to drawings, design criteria, technical memos, specifications	TM3.2.1 – OCS requirements, Track work Flood elevation clearance
DESIGN CRITERIA REQUIRING A VARIANCE	The vertical clearance of 27 ft for installation of OCS system under new or planned over-crossing structure TOR 2.5 ft above flood elevation
REASON FOR REQUESTING VARIANCE	Any further rise of profile of the new structure results in higher project impact, mitigation, delays and cost. Lowering HST will result in track work below estimated flood elevation, which may require boat-section and pump station To eliminate the requirement to lower the track work below the estimated flood elevation a variance to reduce the vertical bridge clearance to 24ft would be required
JUSTIFICATION FOR VARIANCE	To avoid additional environmental impact, mitigation, ROW, Cost, and delay
PROPOSED ALTERNATIVE DESIGN REQUIREMENT	Allow minimum clearance under the new replacement bridge to be **24 ft (DVR 24 ft)**as permitted condition for existing structures *, which also will avoid the need for walls/boat-sections, OR Allow minimum clearance under the new replacement bridge to be **25.5 ft (DVR 25.5** ft)as permitted condition for existing structures *, as shown in Draft 30%, however will require a 1.5 ft walls/boat section and potentially pumping facilities, OR Maintain standard **27 ft clearance**, but provide deeper 3 ft walls/boat section and potentially pumping facilities * as permitted by TM 3.2.1 for crossing under existing bridges of less than 160 ft width.

Part 3 – Impact Analysis

OPERATIONS	N/A
MAINTENANCE	N/A
INFRASTRUCTURE	**General** The existing overhead structure clearance over UPRR is at 22.94 ft. As part of Clinton interchange replacement, this overhead will be demolished and rebuilt. While technically the replacement bridge can be considered to be "new", due to compatibility of replaced Clinton bridges and approaches with other adjacent intersections and facilities that will not be replaced, the design must accommodate "existing" site conditions and profiles. Since replacing an existing structure which needs to conform to existing configurations and constraints on either side of the structure, it is proposed to consider clearance requirements for this location as those required for crossing under an existing overhead (i.e. 24 ft clearance). Current draft 30% design has provided a transitional profile grade to the Fresno-Bakersfield (FB) design group which leads to a boat-section further south adjacent to Roeding Park. This grade provides for HST track clearance of 25.5 ft (requires DVR 25.5 ft plus 1.5 ft wall/boat section). Raising Clinton Ave profile further to provide the 27 feet clearance over HSR will result in impacts to the approach, bridge and nearby intersection and ROW, making the revisions impractical. Exhibits 1 through 5 show draft 30% design plans at Clinton Ave. Exhibit 1 and 5 show revised Clinton overhead bridge profile grade and clearance over HST. Note the profile grade of 6.0% from local Weber street intersection to the Caltrans Clinton/SR99 interchange and ramps. This grade is already substandard, pending consideration and approval by Caltrans. Design options to consider at this location are: A. Raising Clinton Ave roadway Profile B. Design Variance to reduce clearance to 24 ft, with no need for flood protection walls/boat section C. Design Variance to reduce clearance to 25.5 ft, with 1.5 ft deep flood protection walls/boat section (Intermediate Option) D. Standard 27 ft clearance, requiring 3 ft deep flood protection walls/boat section

	A- Roadway Profile Adjustments Modifying the Clinton Ave overhead replacement structure to raise the roadway profile further so that clearance over HST can be raised to 27 ft is not feasible due to geometric factors including the following: • Compared to 15% design, the roadway profile has already been raised by approximately 1.5 ft to offset clearance errors associated with the initial mapping accuracy of +/- 3 ft. • The profile rise impact already has resulted in modification of Weber/Clinton intersection by raising the intersection and tapering the effects on approach roadway (see Exhibit 3). This "refinement" which is beyond the DEIR/EIS footprint has already been noted to the agencies, and considered to be minor refinement to avoid/minimize impacts. When impacts exceed "minor" level, reevaluation and recirculation of DEIR/EIS may be required. • Further raising of Clinton Ave overhead structure to achieve 27' clearance will require profile grade modification which can impact both approaches, Weber street intersection and profile of the structure approaching the interchange, SR99 crossing and ramps. • The profile grade modification will further raise the Weber street intersection, rise the approaching roadways even further, increase the footprint impact to the intersection, further impact the adjacent parcels, and may require retaining wall which can impact property access adjacent to this intersection. • Note that geometry, and width of the structure includes several exceptions, pending review and approval of Caltrans. **B-DVR 24 ft clearance, w/ no walls/Boat Section** Original HSR profile design was based on preliminary mapping. In addition, in absence of flood elevation information, a conservative approach of keeping TOR 4 ft above average existing ground elevation in the vicinity was

	used to meet the flood elevation requirements. Current draft 30% roadway design, as shown in Exhibit 4 is based on current mapping. It should be noted that as a result of the poor accuracy of the initial mapping (+/- 3 ft accuracy), lower clearance was discovered when using the updated mapping. The current draft 30% design has already adjusted the roadway profile and HST profile to provide additional 1 ft clearance due to the initial mapping accuracy issues. Subsequent evaluation and adjustment of the 30% profile design were conducted based on : • Updated mapping (+/- 0.5 ft accuracy) • Estimated flood elevation requirement Based on FEMA evaluations and maps, 100 year flood event will impact regions near San Joaquin River, Herndon Canal and south of Clinton. Local area adjacent to Clinton Ave, is therefore subject to only localized flooding for which flood agencies use 6 inch water elevation above existing ground/Golden State Blvd.. At Clinton crossing, existing ground is at 297.5 ft. Allowing for 0,5 flood elevation (i.e. elevation 298), TOR at 2.5 ft higher will be at minimum elevation of 300.5 ft. A track profile with 24 ft clearance below the Clinton overhead structure, will meet flood elevation requirements with no need for boat section. **C-DVR 25.5 ft clearance, w/ 1.5 ft deep Wall/Boat Section** The draft 30% HST track profile design shown in Exhibit 4, provides for an intermediate option of 1.5 ft higher 25.5 ft clearance over HSR tracks, by lowering the profile. The estimated flood elevation will impact the current 30% design with the DVR 25.5 ft clearance condition, requiring a 1.5 ft wall/boat section. As shown in exhibit 7, the draft 30% design HST profile (in black) will have TOR below minimum 300.5 ft level to clear flood elevation requirement, for nearly 1000 ft North of Clinton. This is primarily due to the HST profile adjustment required due to the initial mapping accuracy/errors. To meet flood elevation clearance requirements, it is proposed to consider wall/boat-section to protect track work

	under the estimated flood elevation condition. It should be noted that Clinton is the interface with Fresno-Bakersfield (FB) section to the South, and that the segment directly south of Clinton transitions to a boat-section, adjacent to Roeding Park. It is feasible to have the boat-section at Clinton transition to the FB boat-section. **D-Standard 27 ft clearance (no DVR), w/ 3 ft Wall/Boat Section** The current draft final 30% design of HSR profile was further refined to examine conditions which can increase clearance under the new Clinton Ave structure from 25.5 ft to the standard 27 ft clearance. As shown in profile design plan in Exhibit 7 (Red line), without increasing the length of the boat-section, the profile of HSR can be revised/steepened to sag another 1.5 ft under Clinton and meet the 27 ft clearance. The estimated flood elevation will impact the lowered track profiles to meet the standard 27 ft clearance condition, requiring a 3 ft wall/boat section. **Other requirements for Adjusted HST profile** For both the existing 30% design (25.5 ft clearance) as well as the refined profile design (27 ft clearance requiring DVR), the potential design issues to be considered are: • May result in more frequent profile rise and fall at constrained locations (Veterans Blvd, Ashlan, Clinton) • For DVR 25.5 ft and Standard 27 ft clearance, where HST tracks are below estimated flood elevation, walls/boat-section maybe required. Additionally, drainage of the lowered HST section may require pump station As shown in Exhibit 6 calculations, for clearance under the replaced Clinton Ave , the tracks below the estimated requirement for flood elevation clearance (i.e. TOR of 300.5 ft) will be 1.5 ft wall for 25.5 ft clearance. Note that the length of the required walls/boat-section however does not change since the additional clearance is providing by steepening the HST profile grade only. DVR 24 ft clearance option will clear flood elevation requirements with no need for walls/boat sections.

	Drainage conditions of the low point will have to be refined to investigate feasibility of draining into a nearby flood control facility. In absence of such options, design may consider implementation and operation of a pump station to pump storm water and/or local flood water from the low point. As noted earlier, the pump station near Clinton can be considered in conjunction with the boat-section design of the FB design, adjacent to Roeding Park. The boat-section unit cost is estimated at 18.5M/mile for a 7 ft deep section ($2M to $3M for 1000 ft of 1.5 to 3.0 ft deep). Pump stations are estimated at $3 million, with equipment replacement and O&M equivalent to $300K per 20 year intervals. The requested DVR for 24 ft clearance under Clinton Overhead will satisfy flood elevation requirements with no need for boat sections. A 1.5 ft or 3.0 ft boat-section (with or without pump station) will be required for both conditions of 25.5 ft DVR, or 27 ft standard clearance conditions, respectively. The local topography however may be draining storm water to the south with limited chance of local flooding at Clinton. This can further be addressed, if the section is transitioned to FB boat-section with lower grade. **Recommendation** ***Consider a variance of 25.5 ft clearance, along with flood protection walls/boat section of 1.5 ft in height. Flood elevations are based on local flood agency coordination, and are assumed to be 6 inches above existing Golden State Boulevard surface (existing ground) .*** **Justification** Without raising the Clinton Ave profile which has the potential to increase project impact and footprint beyond the DEIR/EIS coverage, refinement of the current draft 30% HST profile design provide the following options: 1. With an approved DVR, consider 25.5 ft clearance, as permitted for crossing under existing structures, since the existing constraints bounding the replaced Clinton Ave overhead are prohibitive from further adjusting the roadway profile. In addition may need

<table>
<tr><td></td><td>to use 1.5 ft deep boat-section and pump station to protect track work from the estimated flood elevation.

Note that since the FB section immediately south of Clinton uses a boat section adjacent to Roeding Park, this alternative will provide a compatible design, while meeting clearance requirements.</td></tr>
<tr><td>RAILROAD SYSTEMS</td><td>N/A</td></tr>
<tr><td>RELIABILITY / FUNCTIONALITY</td><td>N/A</td></tr>
<tr><td>THIRD PARTY (Utility, Freight, Caltrans, RR, other)</td><td>Raising Clinton Ave profile will require coordination and approval by Caltrans and City of Fresno.

Drainage of the boat-section storm water and flood water may require coordination with local flood protection agencies</td></tr>
<tr><td>SAFETY AND SECURITY</td><td>N/A</td></tr>
<tr><td>DIRECT COST</td><td>
<table>
<tr><th colspan="2">Raising Clinton Roadway profile and revising Interchange *</th></tr>
<tr><td>Other</td><td>Changes beyond DEIR/EIS footprint, requiring reevaluation, cost associated with additional engineering, environmental and delays</td></tr>
<tr><td colspan="2">* assume profile raised so there is no boat section</td></tr>
</table>
<table>
<tr><th>24 ft Clearance DVR
(no need for boat-section/ pump station)</th></tr>
<tr><td>No additional cost</td></tr>
</table>
<table>
<tr><th colspan="2">RECOMMEDNED OPTION
25.5 ft Clearance DVR + 1.5 ft wall/boat-section and pump station</th></tr>
<tr><td>Wall/Boat Section</td><td>$2M (1.5 ft deep)</td></tr>
<tr><td>Pump equipment</td><td>$0.5M</td></tr>
<tr><td>Pump Station & facility</td><td>$2.5 Million</td></tr>
<tr><td>Reoccurring pump replacement cost</td><td>$300 K/20 years</td></tr>
<tr><td>Other</td><td>General maintenance</td></tr>
</table>
<table>
<tr><th colspan="2">27 ft Clearance, No DVR + 3.0 ft wall/boat-section and pump station</th></tr>
<tr><td>Wall/Boat Section</td><td>$3M (3.0 deep)</td></tr>
<tr><td>Pump equipment</td><td>$0.5M</td></tr>
</table>
</td></tr>
</table>

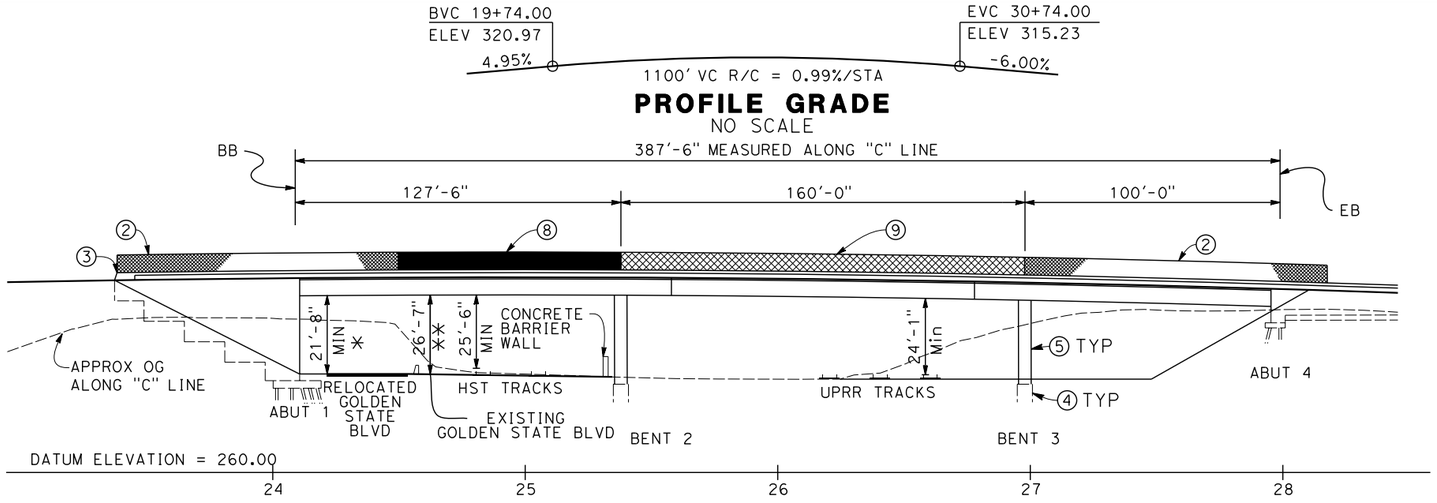
	Pump Station & facility	$2.5 Million
	Reoccurring pump replacement cost	$300 K/20 years
	Other	General maintenance
OTHER	Raising the profile of the roadway will result in change of project footprint, additional ROW impact, environmental and engineering effort, delays in environmental, design as well as procurement package 1 (ARRA)	

Part 4 – Mitigation Measures

Part 5 – List of Supporting Documentation to Design Variance Request

ANALYSIS	See discussion above, attached exhibits, and draft 30% design plans.
PUBLICATION/STANDARDS EXTRACTS	N/A
RISK ASSESSMENT	N/A
DRAWINGS	See Exhibits 1 thru 5, and 7
CALCULATIONS	See Exhibit 6 for recommended case
EXPERT TESTIMONIALS	N/A
CORRESPONDENCE	N/A
OTHER	

Do not attach superfluous materials, such as complete project plan sets or engineering reports unless specifically requested.



PROFILE GRADE
NO SCALE

ELEVATION
SCALE: 1"=30'-0"

NOTES:

1. CONCRETE BARRIER (TYPE 26 MODIFIED)
2. CHAIN LINK RAILING (TYPE 7 MODIFIED)
3. CONCRETE BARRIER (TYPE 736 MODIFIED)
4. 6'-0" DIA CIDH PILE
5. 5'-6" DIA COLUMN
6. STRUCTURE APPROACH, TYPE N(30S)
7. EXISTING UPRR ROW TO BE CONFIRMED ON SITE
8. AR FENCE WITH SOLID PLATE
9. AR FENCE

* TEMPORARY FALSEWORK CLEARANCE = 19'-9"
FALSEWORK DEPTH = 1'-10"

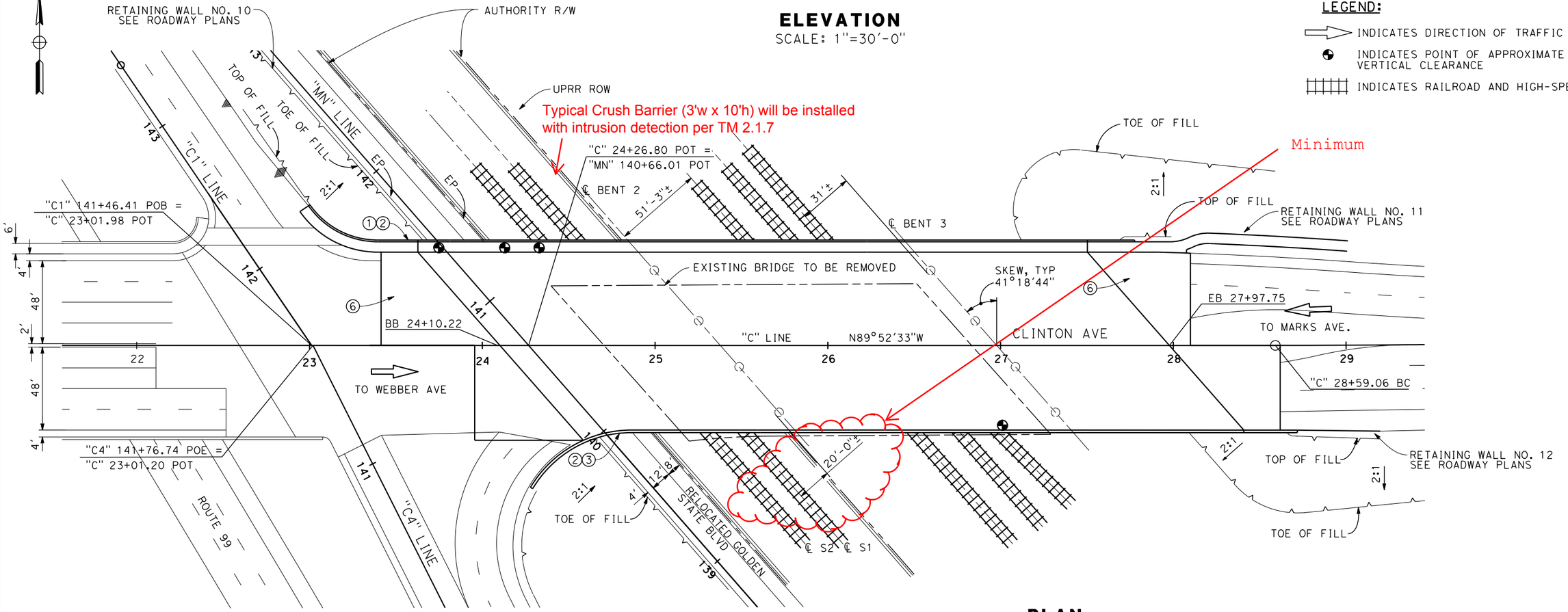
** TEMPORARY FALSEWORK CLEARANCE = 24'-8"
FALSEWORK DEPTH = 1'-10"

LEGEND:

INDICATES DIRECTION OF TRAFFIC

INDICATES POINT OF APPROXIMATE MINIMUM VERTICAL CLEARANCE

INDICATES RAILROAD AND HIGH-SPEED TRAIN TRACK



PLAN
SCALE: 1"=30'-0"

Clinton Avenue - Exhibit 1

HSR 13-06 - EXECUTION VERSION

REV	DATE	BY	CHK	APP	DESCRIPTION

DESIGNED BY D. FREDERICKS
DRAWN BY P. WALKER
CHECKED BY H. STRANDGAARD
IN CHARGE F. NOBARI
DATE 12/08/11

PROPOSED PRELIMINARY DESIGN
NOT FOR CONSTRUCTION

AECOM Technical Services, Inc.
2020 L Street, Suite 300
Sacramento, CA 95811
CH2MHILL

CALIFORNIA HIGH-SPEED RAIL AUTHORITY

CALIFORNIA HIGH-SPEED TRAIN PROJECT
MERCED TO FRESNO
PACKAGE 1A
ROADWAY
FRESNO YARD OVERHEAD (CLINTON/UPRR)
GENERAL PLAN

CONTRACT NO.
DRAWING NO. ST-11017
SCALE AS SHOWN
SHEET NO.

NOTES:

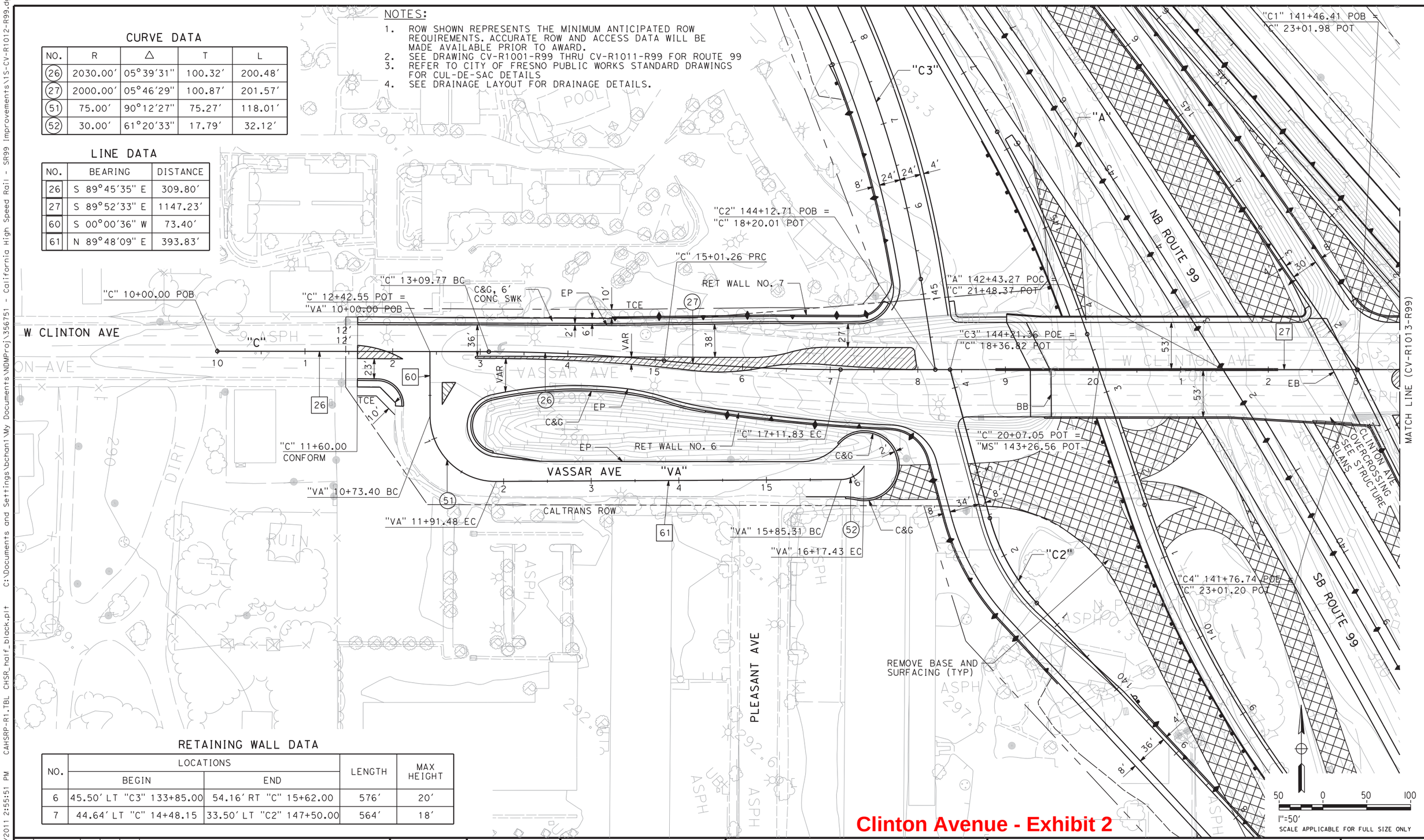
1. ROW SHOWN REPRESENTS THE MINIMUM ANTICIPATED ROW REQUIREMENTS. ACCURATE ROW AND ACCESS DATA WILL BE MADE AVAILABLE PRIOR TO AWARD.
2. SEE DRAWING CV-R1001-R99 THRU CV-R1011-R99 FOR ROUTE 99
3. REFER TO CITY OF FRESNO PUBLIC WORKS STANDARD DRAWINGS FOR CUL-DE-SAC DETAILS
4. SEE DRAINAGE LAYOUT FOR DRAINAGE DETAILS.

CURVE DATA

NO.	R	Δ	T	L
(26)	2030.00′	05°39′31"	100.32′	200.48′
(27)	2000.00′	05°46′29"	100.87′	201.57′
(51)	75.00′	90°12′27"	75.27′	118.01′
(52)	30.00′	61°20′33"	17.79′	32.12′

LINE DATA

NO.	BEARING	DISTANCE
26	S 89°45′35" E	309.80′
27	S 89°52′33" E	1147.23′
60	S 00°00′36" W	73.40′
61	N 89°48′09" E	393.83′



RETAINING WALL DATA

NO.	LOCATIONS		LENGTH	MAX HEIGHT
	BEGIN	END		
6	45.50′ LT "C3" 133+85.00	54.16′ RT "C" 15+62.00	576′	20′
7	44.64′ LT "C" 14+48.15	33.50′ LT "C2" 147+50.00	564′	18′

50 0 50 100
1"=50′
SCALE APPLICABLE FOR FULL SIZE ONLY

Clinton Avenue - Exhibit 2

REV	DATE	BY	CHK	APP	DESCRIPTION
A	##/##/##	XX	XX	XX	

DESIGNED BY G. MANOREK
DRAWN BY R. MITRY
CHECKED BY L. HEUSTON
IN CHARGE F. NOBARI
DATE 09/30/2011

PROPOSED PRELIMINARY DESIGN

NOT FOR CONSTRUCTION

AECOM Technical Services, Inc.
2020 L Street, Suite 300
Sacramento, CA 95811
CH2MHILL

CALIFORNIA HIGH-SPEED RAIL AUTHORITY

CALIFORNIA HIGH-SPEED TRAIN PROJECT
SIERRA SUBDIVISION
PACKAGE 1
ROADWAY
LAYOUTS
SR 99 RE-ALIGNMENT

CONTRACT NO.
DRAWING NO. CV-R1012-R99
SCALE AS SHOWN
SHEET NO.

HSR 13-06 - EXECUTION VERSION

CURVE DATA

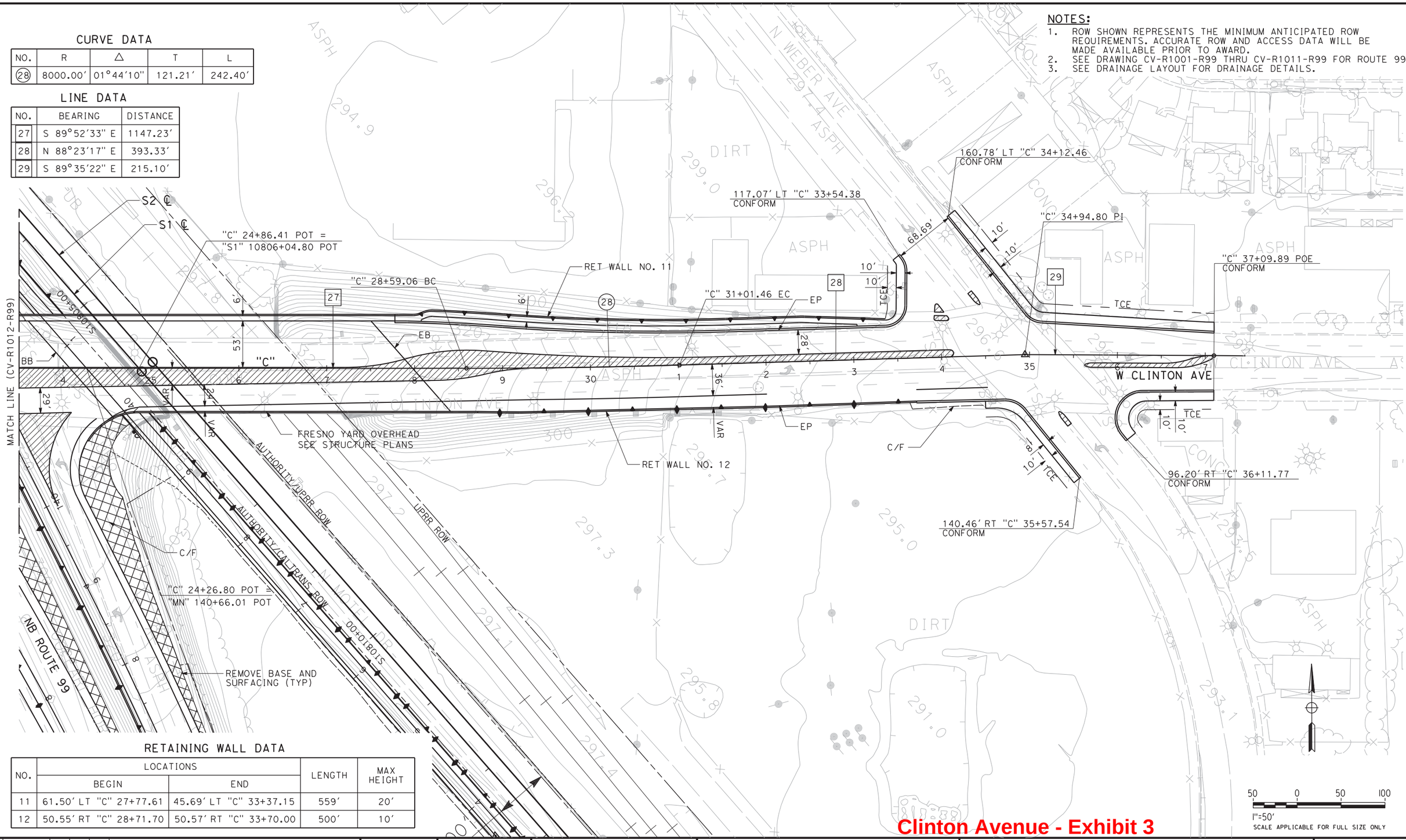
NO.	R	Δ	T	L
(28)	8000.00′	01°44′10"	121.21′	242.40′

LINE DATA

NO.	BEARING	DISTANCE
27	S 89°52′33" E	1147.23′
28	N 88°23′17" E	393.33′
29	S 89°35′22" E	215.10′

NOTES:

1. ROW SHOWN REPRESENTS THE MINIMUM ANTICIPATED ROW REQUIREMENTS. ACCURATE ROW AND ACCESS DATA WILL BE MADE AVAILABLE PRIOR TO AWARD.
2. SEE DRAWING CV-R1001-R99 THRU CV-R1011-R99 FOR ROUTE 99
3. SEE DRAINAGE LAYOUT FOR DRAINAGE DETAILS.



RETAINING WALL DATA

NO.	LOCATIONS		LENGTH	MAX HEIGHT
	BEGIN	END		
11	61.50′ LT "C" 27+77.61	45.69′ LT "C" 33+37.15	559′	20′
12	50.55′ RT "C" 28+71.70	50.57′ RT "C" 33+70.00	500′	10′

50 0 50 100
1"=50′
SCALE APPLICABLE FOR FULL SIZE ONLY

Clinton Avenue - Exhibit 3

REV	DATE	BY	CHK	APP	DESCRIPTION
A	##/##/##	XX	XX	XX	

DESIGNED BY G. MANOREK
DRAWN BY R. MITRY
CHECKED BY L. HEUSTON
IN CHARGE F. NOBARI
DATE 09/30/2011

PROPOSED PRELIMINARY DESIGN

NOT FOR CONSTRUCTION

AECOM Technical Services, Inc.
2020 L Street, Suite 300
Sacramento, CA 95811
CH2MHILL

CALIFORNIA HIGH-SPEED RAIL AUTHORITY

CALIFORNIA HIGH-SPEED TRAIN PROJECT
SIERRA SUBDIVISION
PACKAGE 1
ROADWAY
LAYOUTS
SR 99 RE-ALIGNMENT

CONTRACT NO.
DRAWING NO. CV-R1013-R99
SCALE AS SHOWN
SHEET NO.

HSR 13-06 - EXECUTION VERSION

AXIS OF ROTATION

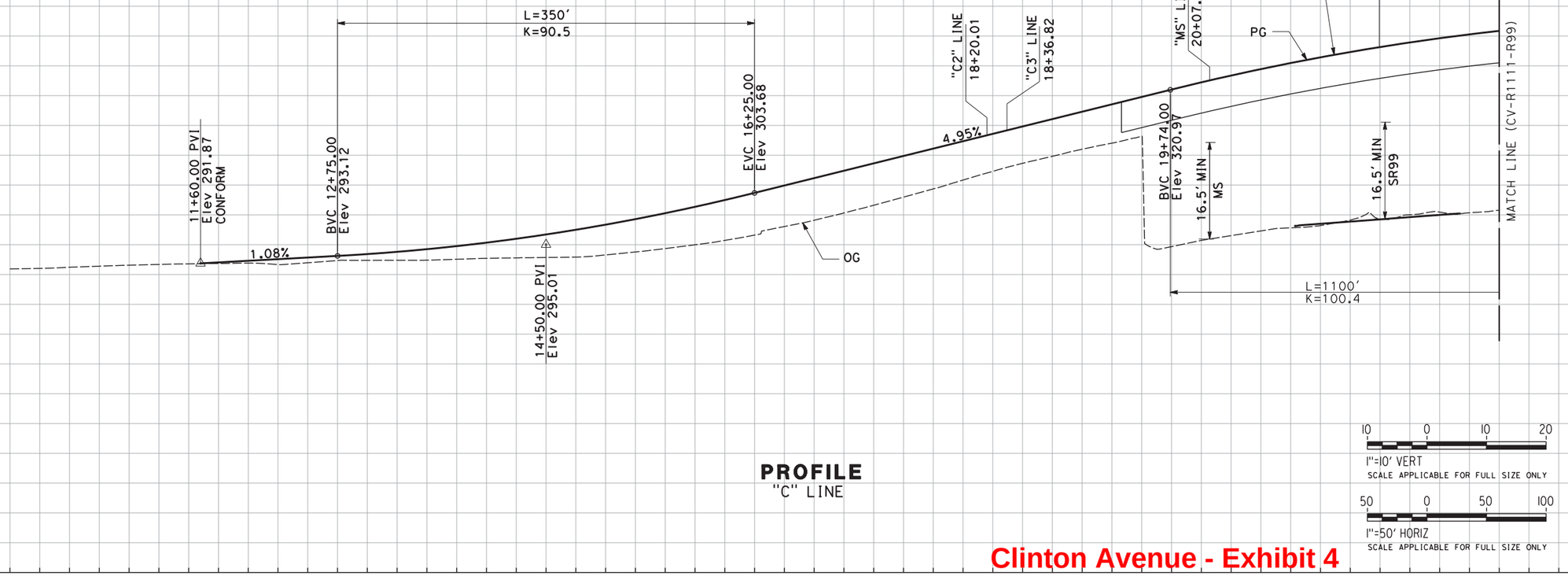
LT & RT EP -2%

11+60.00
CONFORM

MATCH LINE (CV-R1111-R99)

SUPERELEVATION DIAGRAM

NO SCALE



PROFILE

"C" LINE

10 0 10 20
1"=10' VERT
SCALE APPLICABLE FOR FULL SIZE ONLY

50 0 50 100
1"=50' HORIZ
SCALE APPLICABLE FOR FULL SIZE ONLY

STATION 9 10+00 1 2 3 4 15+00 6 7 8 9 20+00 1 2 3

240 250 260 270 280 290 300 310 320 330

Clinton Avenue - Exhibit 4

REV	DATE	BY	CHK	APP	DESCRIPTION
A	##/##/##	XX	XX	XX	

DESIGNED BY G. MANOREK
DRAWN BY B. CHAN
CHECKED BY L. HEUSTON
IN CHARGE F. NOBARI
DATE 09/30/2011

PROPOSED PRELIMINARY DESIGN

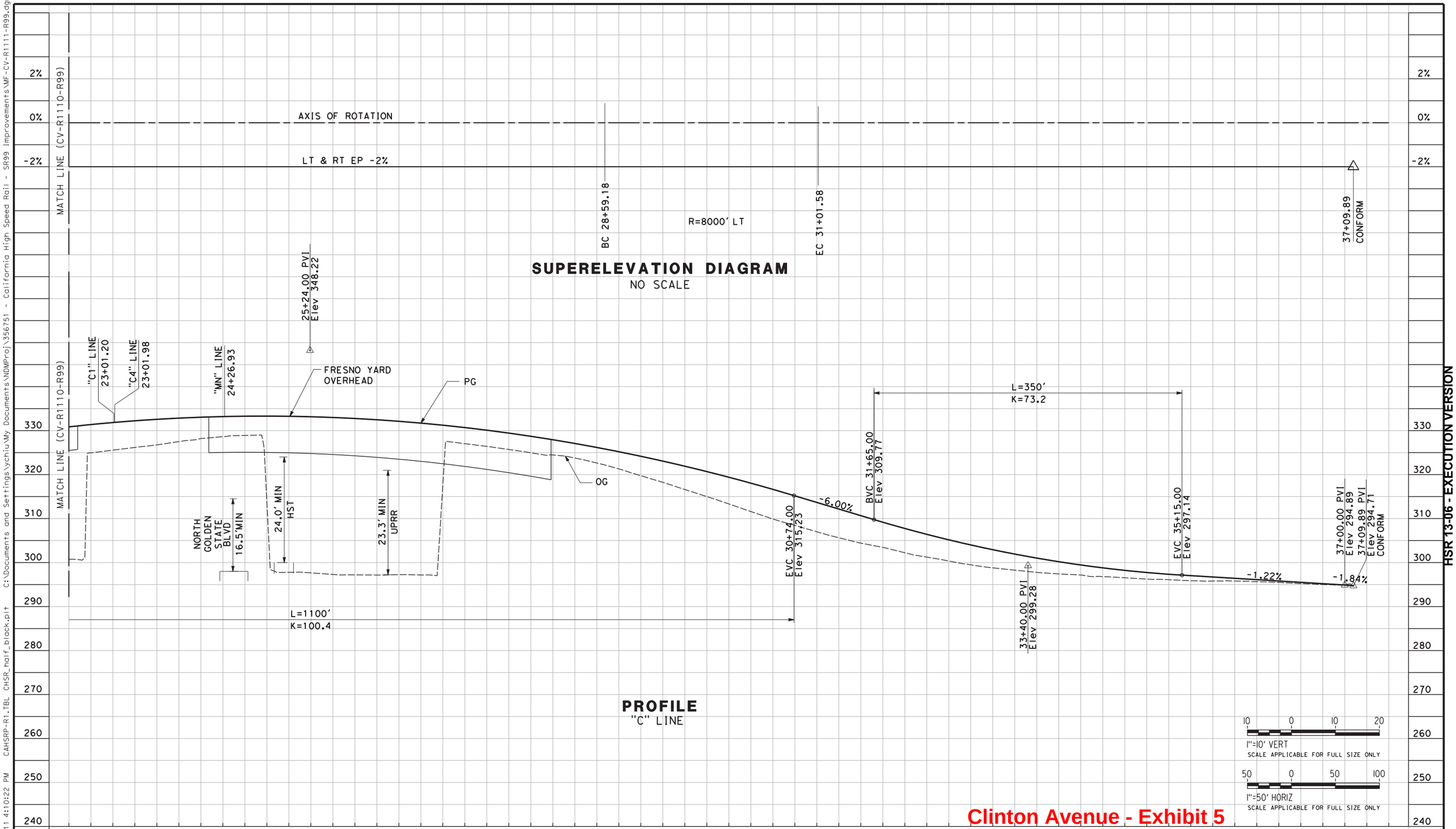
NOT FOR CONSTRUCTION

AECOM
Technical Services, Inc.
2020 L Street, Suite 300
Sacramento, CA 95811
CH2MHILL

CALIFORNIA HIGH-SPEED RAIL AUTHORITY

CALIFORNIA HIGH-SPEED TRAIN PROJECT
SIERRA SUBDIVISION
PACKAGE 1
ROADWAY
PROFILE AND SUPERELEVATION
SR 99 RE-ALIGNMENT

CONTRACT NO.
DRAWING NO. CV-R1110-R99
SCALE AS SHOWN
SHEET NO.



SUPERELEVATION DIAGRAM
NO SCALE

PROFILE
"C" LINE

HSR 13-06 - EXECUTION VERSION

Clinton Avenue - Exhibit 5

REV	DATE	BY	CHK	APP	DESCRIPTION
A	##/##/##	XX	XX	XX	

DESIGNED BY G. MANOREK
DRAWN BY B. CHAN
CHECKED BY L. HEUSTON
IN CHARGE F. NOBARI
DATE 09/30/2011

PROPOSED PRELIMINARY DESIGN

NOT FOR CONSTRUCTION

AECOM Technical Services, Inc.
2020 L Street, Suite 300
Sacramento, CA 95811
CH2MHILL

CALIFORNIA HIGH-SPEED RAIL AUTHORITY

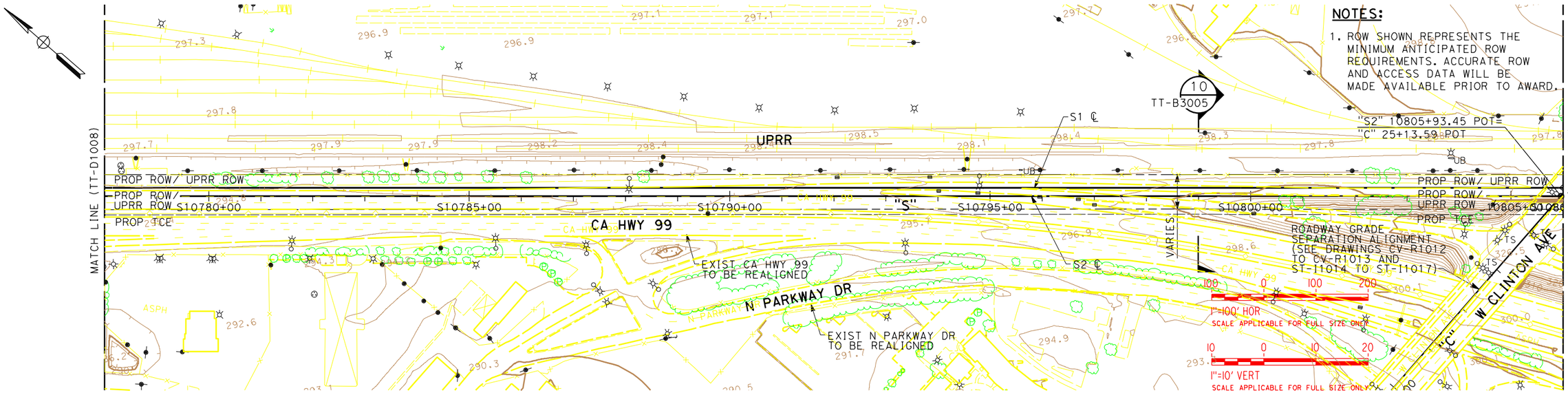
CALIFORNIA HIGH-SPEED TRAIN PROJECT
SIERRA SUBDIVISION
PACKAGE 1
ROADWAY
PROFILE AND SUPERELEVATION
SR 99 RE-ALIGNMENT

CONTRACT NO.
DRAWING NO. CV-R1111-R99
SCALE AS SHOWN
SHEET NO.

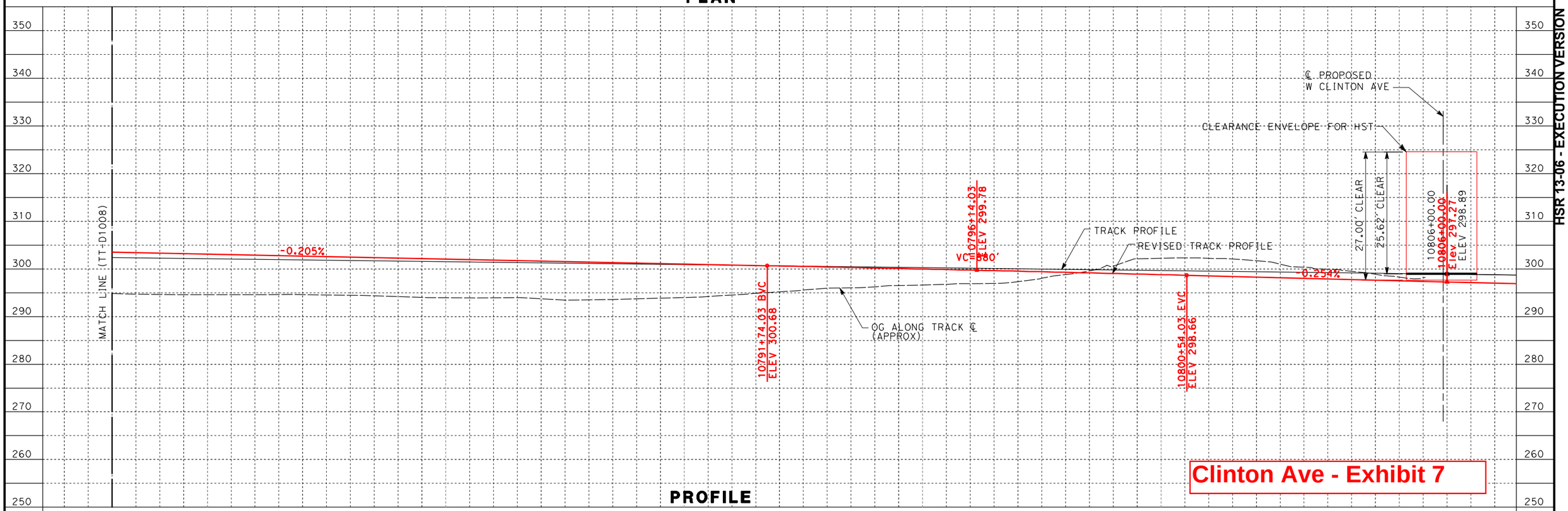
Exhibit 6

25.5' Min Vertical Clearance (Recommedned)

CLINTON AVE					
Structure Depth =	7.33'				
Clearance Check Locations:	STA ("C")	CL ELEV	Offset	EP ELEV	Soffit ELEV
A - NB Track	24+54.58	333.28	61.50	332.05	324.72
B - NB Track	25+52.49	332.97	50.53	331.96	324.63
C - SB Track	24+32.67	333.22	61.50	331.99	324.66
D - SB Track	25+30.57	333.12	50.53	332.11	324.78
Clearance Check Locations:	STA ("S1" or "S2")	TOR ELEV		**Vert Clr (Soffit - TOR)**	
A - NB Track	10805+28.13	297.98		**26.74**	
B - NB Track	10806+76.72	298.80		**25.83**	
C - SB Track	10805+13.71	299.00		**25.66**	Min
D - SB Track	10806+62.30	298.82		**25.96**	



PLAN



PROFILE

Clinton Ave - Exhibit 7

HSR 13-06 - EXECUTION VERSION

$FILE$ $PLTDRVS$ $PENTBLS$ $TIME$ $DATE$ $USER$

REV	DATE	BY	CHK	APP	DESCRIPTION

DESIGNED BY A. SHIELDS
DRAWN BY H. SULLIVAN
CHECKED BY A. BOONE
IN CHARGE A. BOONE
DATE 10/10/2011

PROPOSED PRELIMINARY DESIGN

NOT FOR CONSTRUCTION

AECOM Technical Services, Inc.
2020 L Street, Suite 300
Sacramento, CA 95811
CH2MHILL

CALIFORNIA HIGH-SPEED RAIL AUTHORITY

CALIFORNIA HIGH-SPEED TRAIN PROJECT
SIERRA SUBDIVISION
PACKAGE 1
TRACK GUIDEWAY
PLAN AND PROFILE
STA. 10778+00 TO 10806+00

CONTRACT NO.
DRAWING NO. TT-D1009
SCALE AS SHOWN
SHEET NO.

California High-Speed Train Project

DESIGN VARIANCE COVER SHEET

Design Variance Request Number: URS-INF-1-0009

Design Variance Request Title: Transverse Utility Encroachment

Prepared by:

URS/HMM/Arup A Joint Venture Company	10 Jan 2012
Regional Consultant	Date

PMT Review:

Richard Schmedes	8 Nov 2011
Systems	Date
John Chirco	15 May 2012
Infrastructure	Date
Joseph Metzler	21 Oct 2011
Operations/Maintenance/Safety	Date
Frank Banko	12 Oct 2011
Rolling Stock	Date
Vladimir Kanevsky	4 Nov 2011
Regulatory Approvals	Date
Tony Murphy	6 Mar 2012
System Integration	Date

PMT Recommended:

Thomas Tracy	16 May 2012
PMT Regional Manager	Date

PMT Approval:

Ken Jong	16 May 2012
Engineering Manager	Date

Agency Concurrence:

CHSR Authority Chief Engineer	Date

CHST DESIGN VARIANCE REQUEST FORM

Part 1 – Design Variance Request Information

Title/Subject: Traverse Utility Encroachment

Number: **URS-INF-1-0009** **Revision:** **1**

Contract Name & Number (Final Design): HSR 06-0003

Region: Fresno - Bakersfield

Location: Fresno

Regional Consultant's / Third Party Design Drawing Reference:

Date Submitted to RMT & PMT

PREPARED / SUBMITTED BY: NAME: James A. Labanowski Jr., P.E. COMPANY: URS/HMM/Arup A Joint Venture Company SIGNATURE: James A. Labanowski Jr. DATE: 01/10/12	REGISTERED PROFESSIONAL ENGINEER James A. Labanowski Jr. No. 55039 Exp. 06/30/12 CIVIL STATE OF CALIFORNIA

**Note design variance numbers will follow the same convention:* "ABC" will abbreviate the name of the firm submitting the variance, "DEF" abbreviates the name of firm receiving the variance request, "X" is the revision number starting from 0, and the last four numbers count the number of total submittals staring from one.

Part 2 – Design Variance Request Information

CHSTP DESIGN REQUIREMENT	TM 2.7.5 Designer's Responsibilities and Utility Requirements for 30% Design Level
DESIGN CRITERIA REQUIRING A VARIANCE	TM 2.7.5 Section 6.6.1 – Underground Utilities, states, "At trench sections of the CHSTP, 8 feet or less from the original ground, the utilities shall cross under CHSTP trench sections in casing and top of casing shall be at minimum 8 feet below top of rail. Where the CHSTP trench section is deep, utilities shall cross over the trench section in a utility bridge that spans the entire width of trench section."
REASON FOR REQUESTING VARIANCE	The existing 96-inch storm drain would be in direct conflict with the trench. The bottom of the trench is proposed to be approximately 40 feet below the original ground at the existing 96-inch storm drain. A utility crossing at this location would induce significant risk and liabilities associated with pipe failure. Therefore, the existing 96-inch storm drain will be re-routed north of Belmont Ave in order to provide a more favorable crossing. The 96-inch storm drain will turn south and run between Roeding Park and the trench for approximately 500 feet. In this area the trench is planned to be approximately 11 feet from the edge of Roeding Park. Horizontally, the storm drain will be conveyed in a box culvert outside the CHSTP right-of-way (ROW). At the crossing, the 96-inch storm drain will pass under the trench structure when the bottom of the trench is more than 8 feet from original ground. Exhibits in Appendix A illustrate how this pipe could be relocated.
JUSTIFICATION FOR VARIANCE	To cross at a point where the bottom of trench is 8 feet or less from the original ground would relocate the pipe an additional 600 feet north of the proposed crossing location. The distance between the CHSTP ROW and Roeding Park is smaller at this point compared to the proposed crossing location and would likely result in a substandard horizontal clearance. Achieving the standard vertical clearance for the 96-inch storm drain would require an additional 1,200 feet of pipe, excavation to lower a portion of the existing basin floor, and installation of a ramp for maintenance access to the proposed outlet structure. This type of impact to the existing basin has not been cleared environmentally. The addition of another 1,200 feet of 96-inch pipe would unnecessarily impact several more utilities and would prove more difficult to construct outside the CHSTP ROW being within the area having reduced spacing between Roeding Park and the CHSTP ROW. In that case achieving the standard horizontal clearances for the 96-

	inch storm drain using a standard circular pipe would require either an encroachment into Roeding Park, an encroachment into Union Pacific Railroad (UPRR) right-of-way, a substandard CHSTP right-of-way, or a design variance for the longintudinal encroachment. Roeding Park is a Section 4(f) property and is not to be impacted by the footprint of the CHSTP. UPRR will not allow the CHSTP to encroach upon their right-of-way. A substandard CHSTP right-of-way is not practicable due to the complexity of construction for the trench in the area. Every effort is being made to avoid the necessity of a design variance for a longitudinal encroachment as a highest goal. Possible alternatives include having the 96-inch storm drain maintain its existing horizontal alignment but cross under the trench at a deeper location. The bottom of the trench is approximately 40 feet below original ground at this location and a utility crossing here carries a higher risk. An additional alternative would be a utility crossing over the CHSTP, which would require a pump station. The FMFCD considers pump stations undesirable due to maintenance and associated liabilities. The existing 96-inch storm drain is the outlet into Basin RR-2 for approximately 1,170 acres of urban development in Fresno. To be relocated along the existing horizontal alignment the depth of the existing storm drain would require a pump for the pipe to cross over the trench section. The liability of a pump failure and the subsequent flooding that would occur upstream, and possibly spill in to the trench section, is much greater than the encased pipe below and alongside the trench. The large flows into Basin RR-2 during large rain events render the pumps impracticable.
PROPOSED ALTERNATIVE DESIGN REQUIREMENT	Require 100+ year design life, plus casing, and increased inspections for all utilities crossing under a trench section deeper than 8 feet from original ground.

Part 3 – Impact Analysis

OPERATIONS	There are no additional CHSTP operations impacts identified from this variance request.
MAINTENANCE	There are no additional CHSTP maintenance impacts identified from this variance request.
INFRASTRUCTURE	There are no additional CHSTP infrastructure impacts identified from this variance.
RAILROAD SYSTEMS	There are no additional CHSTP railroad systems impacts identified from this variance request.
RELIABILITY / FUNCTIONALITY	Would increase reliability compared to a pump option.

THIRD PARTY (Utility, Freight, Caltrans, RR, other)	The Fresno Metropolitan Flood Control District, owner and operator of the 96-inch storm drain, prefers this option to the pump on the east side of UPRR.
SAFETY AND SECURITY	There are no additional CHSTP safety and security impacts identified from this variance request.
DIRECT COST	Accommodating the CHSTP criteria for transverse utilities could result in two separate and distinct cost and schedule delays. The first could be associated with shifting UPRR to the east to provide the required area between the CHSTP ROW and Roeding Park to place the storm drain. The second could be the construction complexity and related costs associated constructing the trench structure within a reduced CHSTP ROW to allow for the storm drain to existing between Roeding Park and the CHSTP ROW.
OTHER	None identified

Part 4 – Mitigation measures

THIRD PARTY (Utility, Freight, Caltrans, RR, other)	Contribute to increased inspections of the 96-inch storm drain to ensure its integrity.

Part 5 – List of Supporting Documentation to Design Variance Request

ANALYSIS	N/A
PUBLICATION/STANDARD EXTRACTS	N/A
RISK ASSESSMENT	N/A
DRAWINGS	N/A
CALCULATIONS	N/A
EXPERT TESTIMONIALS	N/A
CORRESPONDENCE	N/A
OTHER	Memorandum: CHSR Fresno to Bakersfield, 96-inch Storm Drain and Fresno Grade Separation Construction Alternative Analysis

Appendix A

Memorandum: CHSR Fresno to Bakersfield, 96-inch Storm Drain and Fresno Grade Separation Construction Alternative Analysis

URS/HMM/Arup Joint Venture
2495 Natomas Park Drive, Suite 530
Sacramento, CA 95833
Tel: 916-399-0580
Fax: 916-399-0582

MEMORANDUM

To: **Tom Tracy, Regional Manager**
cc: Melisa Bittancourt, Johnny Kuo, Richard Prust, Tim Corcoran, Andrew Armstrong
From: James Labanowski, Utility Discipline Lead
Date: December 15, 2011
Subject: **CHSR Fresno to Bakersfield, 96-inch Storm Drain and Fresno Grade Separation Construction Alternative Analysis**

INTRODUCTION

The existing 96-inch storm drain near Belmont Avenue is in conflict with the Fresno Grade Separation (Trench) of the HST. In order to resolve this conflict the 96-inch storm drain has been relocated to the north of its existing alignment as shown in the 30% Design plans. This memorandum will discuss pertinent background information and potential construction alternatives for the Trench and relocation of the 96-inch storm drain.

BACKGROUND

Alternatives were developed by the URS/HMM/Arup Joint Venture (JV) in coordination with the PMT and Fresno Metropolitan Flood Control District (FMFCD) for the relocation of the existing 96-inch storm drain. Direction was given by the PMT to include in the 30% Design plans Alternative 3 (Gravity Under HST, Reroute System) from the memorandum titled "CHSR Fresno to Bakersfield, 96-inch Storm Drain at Fresno Grade Separation Alternative Analysis" dated September 9, 2011.

The proposed 96-inch storm drain relocation will cross under the Trench in a more favorable location, compared to its existing horizontal alignment, and then parallel the Trench adjacent to Roeding Park. There is approximately 9 feet between the edge of the HST ROW and the boundary of Roeding Park and approximately 6 feet between the outside of the Trench and HST ROW. Roeding Park is a Section 4(f) property and as such is not to be impacted by the construction of the HST.

Three viable construction alternatives were developed and discussed at a meeting held November 17, 2011. Concern was voiced at this meeting by the PMT and EMT regarding the increased longitudinal encroachment and impacts to HST operations when maintenance is required for the 96-inch storm drain. As a result the EMT requested the development of an alternative using a box culvert integrated into the shoring wall that did not encroach into the HST ROW. All four alternatives are presented in the following section. Figures for each alternative are included as attachments.

ALTERNATIVES

Common Features

Common to all alternatives is a steel casing that will be jacked under UPRR and placed first under the Trench. The 96-inch reinforced concrete pipe storm drain will then be placed

within the casing. Additionally, the portion of 96-inch storm drain that is longitudinal to the HST alignment will be constructed prior to the Trench. The longitudinal section of the storm drain will also be placed in a steel casing. Then the construction of the Trench itself will begin.

Alternative 1 – Shoring Wall at Roeding Park Boundary

Alternative 1, presented in Attachment A, proposes using a shoring wall along the boundary of Roeding Park. The shoring wall along the Roeding Park Boundary would be constructed first and allow the construction of the 96-inch storm drain across and longitudinal to the HST alignment. The shoring wall could also be used to form against for one wall of the junction box. The manhole access to the junction boxes would be placed outside the HST ROW. For this alternative, approximately 4.9 feet of the pipe's diameter would encroach into the HST ROW. The outside of the 96-inch storm drain would be approximately 0.7 feet from the outside of the Trench structure.

Concerns over future replacement of the pipe could be mitigated for the longitudinal encroachment by including a stem in the trench structure extending down past the bottom of the 96-inch storm drain to allow for future excavation and removal of the 96-inch storm drain without compromising the integrity of the Trench structure. However, it is doubtful that maintenance of the 96-inch storm drain would require the removal of the pipe. Given the large diameter of the pipe, maintenance activities would more likely occur from inside the pipe.

Alternative 2 – Trench Plate, Flowable Concrete Backfill

Alternative 2, presented in Attachment B, proposes a solution using thin, removable shoring, such as trench plates with hydraulic bracing, and a flowable concrete backfill of the area excavated for the longitudinal 96-inch storm drain construction. The 96-inch storm drain would be constructed longitudinally to the HST alignment using trench plates. Junction boxes would be constructed with wooden forms between the trench plates. In this alternative the 96-inch storm drain encroaches into the HST ROW by approximately 2.7 feet. The outside of the 96-inch storm drain would be approximately 2.9 feet from the outside of the trench structure. For this alternative the excavated area would be backfilled with a flowable concrete mixture.

Future replacement of the pipe is not anticipated. The flowable concrete backfill would encase the pipe and maintenance could occur from the inside of the pipe thereby negating the need to remove the pipe. One potential benefit of Alternative 2 would be the possible use of the concrete backfill in lieu of a separate shoring wall. Further structural analysis and geotechnical investigations would be needed to verify this option. If use of the flowable concrete backfill cannot be substantiated a shoring wall would be necessary and Alternative 2 would effectively become Alternative 3.

Alternative 3 – Trench Plate, Shoring Wall Adjacent to Trench Wall

Alternative 3, presented in Attachment C, proposes a solution using thin, removable shoring, such as trench plates with hydraulic bracing, and a shoring wall adjacent to the Trench. The 96-inch storm drain would be constructed longitudinally to the HST alignment using trench plates. The junction boxes would be constructed with wooden forms between the trench plates. In this alternative the 96-inch storm drain encroaches into the HST ROW by approximately 2.7 feet. The outside of the 96-inch storm drain would be approximately 2.9 feet from the outside of the Trench structure. For this alternative the excavated area would

be backfilled with compacted soil. A shoring wall would then be constructed adjacent to the Trench wall to allow for the construction of the Trench. In order to construct this alternative the shoring wall needs to be 2.5 feet thick opposed to the standard 3 feet. This is because the 96-inch storm drain would encroach 0.1 feet into the standard shoring wall. There would be approximately 0.4 feet between the outside of the 96-inch storm drain and the shoring wall. Further structural analysis and geotechnical investigations would be needed to verify this option.

This shoring wall would provide for the future excavation and removal of the 96-inch storm drain without compromising the integrity of the Trench structure. There are possible construction complications from the close tolerance between the shoring wall and the 96-inch storm drain. As an option the shoring wall could be removed and any future excavation to the pipe could be accomplished using trench plates.

Alternative 4 – Box Culvert, Shoring Wall Adjacent to Trench Wall
Alternative 4, presented in Attachment D, presents a proposed solution similar to Alternative 3 but replaces the longitudinal section of 96-inch storm drain with a 6'x10' precast concrete box culvert. The box culvert would be constructed longitudinally to the HST alignment using trench plates. Junction boxes could be modified sections of the precast concrete box culvert.

This shoring wall would provide for the future excavation and removal of the 96-inch storm drain without compromising the integrity of the Trench structure.

The advantage for this alternative is there is no longitudinal encroachment into the HST ROW. However, this alternative presents some drawbacks. The hydraulic behavior of the box culvert will impact the performance of the upstream storm drainage system. There would be a significant cost increase for this option as a substantial structure. Finally, the FMFCD may find this alternative unacceptable given the risk they would assume and the non-standard replacement/maintenance responsibilities and costs.

ESCAPE STAIRS CONSTRUCABILITY
As an additional discussion item, concerns were raised over how the construction of the HST Trench escape stairs interacts with the 96-inch storm drain. The placement of the escape stairs for the Trench has been coordinated to not conflict with the 96-inch storm drain. The 96-inch storm drain will be routed away from the Trench south of Roeding Park to avoid a possible conflict with the escape stairs. Attachment E illustrates the placement of the stairs in the vicinity of the relocated 96-inch storm drain.

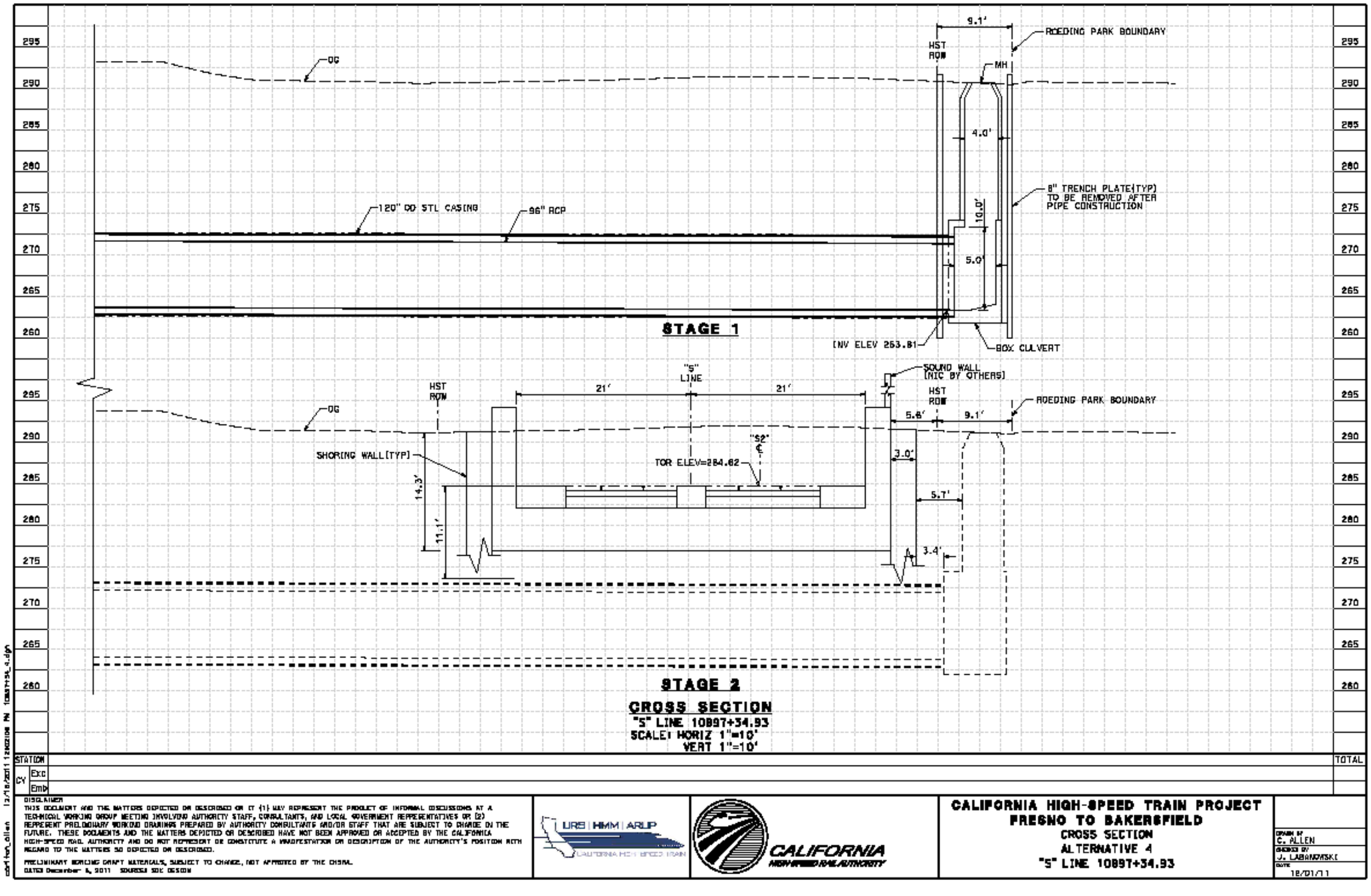
SOUNDWALL
Concerns were also raised over the placement and construction of the future soundwall along this portion of the Trench. The specifications will direct the contractor to allow for the future construction of the soundwall. The trench wall or the shoring wall could be used as the base for the soundwall.

CONCLUSION

The intent of this memorandum is to detail possible construction alternatives for the relocation of the 96-inch storm drain and request direction from the PMT and EMT as to which alternative to show in the 30% Final Design Plans. The options presented are all feasible and constructable and could be incorporated into the 30% Final Design Plans.

ATTACHMENT D

Alternative 4 – Box Culvert, Shoring Wall Adjacent to Trench Wall



DISCLAIMER
THIS DOCUMENT AND THE MATTERS DEPICTED OR DESCRIBED OR IT (1) MAY REPRESENT THE PRODUCT OF INFORMAL DISCUSSIONS AT A TECHNICAL WORKING GROUP MEETING INVOLVING AUTHORITY STAFF, CONSULTANTS, AND LOCAL GOVERNMENT REPRESENTATIVES OR (2) REPRESENT PRELIMINARY WORKING DRAWINGS PREPARED BY AUTHORITY CONSULTANTS AND/OR STAFF THAT ARE SUBJECT TO CHANGE IN THE FUTURE. THESE DOCUMENTS AND THE MATTERS DEPICTED OR DESCRIBED HAVE NOT BEEN APPROVED OR ACCEPTED BY THE CALIFORNIA HIGH-SPEED RAIL AUTHORITY AND DO NOT REPRESENT OR CONSTITUTE A MANIFESTATION OR DESCRIPTION OF THE AUTHORITY'S POSITION WITH REGARD TO THE MATTERS SO DEPICTED OR DESCRIBED.

PRELIMINARY WORKING DRAFT MATERIALS, SUBJECT TO CHANGE, NOT APPROVED BY THE CHSRA.
DATED December 6, 2011 SOURCE: SDE DESIGN

URS | HMM | ARUP
CALIFORNIA HIGH-SPEED TRAIN

CALIFORNIA HIGH-SPEED RAIL AUTHORITY

CALIFORNIA HIGH-SPEED TRAIN PROJECT
FRESNO TO BAKERSFIELD
CROSS SECTION
ALTERNATIVE 4
"S" LINE 10897+34.93

DRAWN BY: C. ALLEN
CHECKED BY: J. LABANOWSKI
DATE: 12/01/11

c:\arhor_allen 12/15/2011 12:02:08 PM 10897+34.4.dgn

HSR 13-06 - EXECUTION VERSION

California High-Speed Train Project

DESIGN VARIANCE COVER SHEET

Design Variance Request Number: URS-INF-2-0001

Design Variance Request Title: Horizontal Clearance to UPRR Right of Way

Prepared by:

URS/HMM/Arup a Joint Venture Company	6 Oct 2011
Regional Consultant	Date

PMT Review:

Richard Schmedes	4 Jun 2012
Systems	Date
John Chirco	15 May 2012
Infrastructure	Date
Joseph Metzler	13 Oct 2011
Operations/Maintenance/Safety	Date
Frank Banko	12 Oct 2011
Rolling Stock	Date
Vladimir Kanevsky	3 Nov 2011
Regulatory Approvals	Date
Oliver Hoehne	12 Mar 2012
System Integration	Date

PMT Recommended:

Thomas Tracy	5 Jun 2012
PMT Regional Manager	Date

PMT Approval:

Ken Jong	5 Jun 2012
Engineering Manager	Date

Agency Concurrence:

CHSR Authority Chief Engineer	Date

CHST DESIGN VARIANCE REQUEST FORM

Part 1 – Design Variance Request Information

Title/Subject: Horizontal Clearance to Union Pacific Railroad Right-of-Way

Number: URS-INF-2-0001 **Revision:** 2

Contract Name & Number (Final Design): HSR 06-0003

Region: Fresno to Bakersfield

Location: Fresno

Regional Consultant's / Third Party Design Drawing Reference: TT-D3006, UT-C4041

Date Submitted to RMT & PMT

PREPARED / SUBMITTED BY: NAME: Richard Coffin COMPANY: URS/HMM/Arup A Joint Venture Company SIGNATURE: DATE: 3/29/12	 (Engineering Seal)

**Note design variance numbers will follow the same convention:* "ABC" will abbreviate the name of the firm submitting the variance, "DEF" abbreviates the name of firm receiving the variance request, "X" is the revision number starting from 0, and the last four numbers count the number of total submittals starting from one.

Part 2 – Design Variance Request Information

CHSTP DESIGN REQUIREMENT Include reference to drawings, design criteria, technical memos, specifications	Memo dated 8/30/2010 – Clearances to conventional railroads, Union Pacific Railroad (UPRR) right-of-way (ROW), high-speed train (HST) bridge piers, and highways – TM reference number not available
DESIGN CRITERIA REQUIRING A VARIANCE	Memo dated 8/30/2010 – Clearances to conventional railroads, UPRR ROW, HST bridge piers, and highways (hereafter referred to as "The Memo"). Drawing 1 – HSR in shared corridor with UPRR at grade, in The Memo requires a minimum 12-foot separation between edge of UPRR ROW and face of derailment containment barrier. An extract is shown in Appendix A.
REASON FOR REQUESTING A VARIANCE	The constraints of State Route 99 and Roeding Park limit the corridor width available to HST. Between W Olive Avenue and E Belmont Avenue the HST corridor would be constrained by UPRR on the east and Roeding Park on the west. This location currently contains Golden State Boulevard which would be replaced with the HST corridor. Roeding Park is a Section 4(f) property and is not to be impacted by the footprint of the HST works. The available width between the UPRR ROW and Roeding Park boundary is 70ft. The available width does not allow for a 60-foot wide HST corridor with a 12-foot separation to the UPRR ROW. Achieving the 12-foot separation to UPRR ROW would require either intrusion into Roeding Park or the UPRR ROW, or a substandard HST ROW width. A layout of the design is shown in Appendix B.
JUSTIFICATION FOR VARIANCE	Roeding Park is a Section 4(f) property and is not to be impacted by the footprint of the HST works. The available width between the UPRR ROW and Roeding Park boundary is 70ft. The available width does not allow for a 60-foot wide HST corridor with a 12-foot separation to the UPRR ROW. Achieving the 12-foot separation to UPRR would require either intrusion into Roeding Park or the UPRR ROW, or a substandard HST ROW width. A substandard HST ROW was dismissed due to the construction complexity already required in this area. Adjacent to Roeding Park the HST would be in a trench and would already require a complex construction sequence to achieve the works within 60-foot HST corridor. The proposed configuration is consistent with the approach set out in TM 1.1.21 – Typical Cross-Sections for 15% Design. Drawing number C0303 identifies the HST ROW adjacent to a freight ROW in a shared corridor. Drawing 1 in The Memo also identifies HST ROW adjacent to a freight ROW for any freight carrier that is not UPRR. Therefore it is understood that locating the HST ROW adjacent to the

	UPRR ROW, with an intrusion protection barrier, does not constitute a safety risk beyond the scenarios identified in the above standards. The proposed cross-section of the HST corridor (Appendix B) meets the intrusion protection criteria in Draft TM 2.1.7 Rev 1 dated 21 July 2011. As part of the proposed design a 96-inch storm drain would require relocating. One of the options for rerouting the storm drain is to construct it between the HST alignment and Roeding Park. Increasing the separation between the UPRR and HST in this area would prohibit this storm drain realignment option. North of Clinton Avenue the alignment must tie in to the Merced to Fresno team alignment, which is constrained by State Route 99.
PROPOSED ALTERNATIVE DESIGN REQUIREMENT	Due to the constraints identified a design variance is requested for the separation criteria between HST and UPRR corridors.

Part 3 – Impact Analysis

OPERATIONS	None identified
MAINTENANCE	Access for inspections and maintenance to the UPRR face of the intrusion barrier may be constrained. A walkway would be provided within the HST ROW for inspection and maintenance of the HST face of the intrusion protection barrier. Access for inspection and maintenance along the UPRR face of the intrusion protection barrier would be from the UPRR ROW.
INFRASTRUCTURE	None identified
RAILROAD SYSTEMS	None identified
RELIABILITY / FUNCTIONALITY	None identified
THIRD PARTY (Utility, Freight, Caltrans, RR, other)	Potential issue for UPRR if its ROW were used for vehicle access to the face of the intrusion protection barrier. The Authority should discuss the potential access arrangements with UPRR. The offset from the nearest UPRR track center to the face of the intrusion barrier exceeds the 25ft minimum required by UPRR.
SAFETY AND SECURITY	Safety of the HSR to be assured by means of derailment containment and intrusion protection. Security of the HSR to be assured by robust fencing and intruder alarm systems. The proposed configuration would not introduce any further safety or security risks beyond those that would be reasonably expected from locating the HST corridor adjacent to any other freight railroad. Drawing 3 in TM 1.1.21 and

	Drawing 1 in The Memo identifies an intrusion protection barrier as close at 25ft from the nearest track. The current design meets the standards for separation of HST and all other railroad operators. Therefore it is understood that locating the HST ROW adjacent to the UPRR ROW, with an intrusion protection barrier, does not constitute a safety risk beyond the scenarios identified in the above standards.
DIRECT COST	None identified
OTHER	Construction of the intrusion protect wall would need an access agreement with the UPRR. Alternatively the wall would need to be constructed from within the HST ROW.

Part 4 – Mitigation measures

OPERATIONS	N/A
MAINTENANCE	Access for inspection and maintenance along the UPRR face of the intrusion protection barrier would be from the UPRR ROW. It is anticipated a permit or authorization agreement would be required with the UPRR. The Authority should discuss the potential access arrangements with UPRR. These agreements are needed in order to determine UPRR requirements.
INFRASTRUCTURE	N/A
RAILROAD SYSTEMS	N/A

Part 5 – List of Supporting Documentation to Design Variance Request

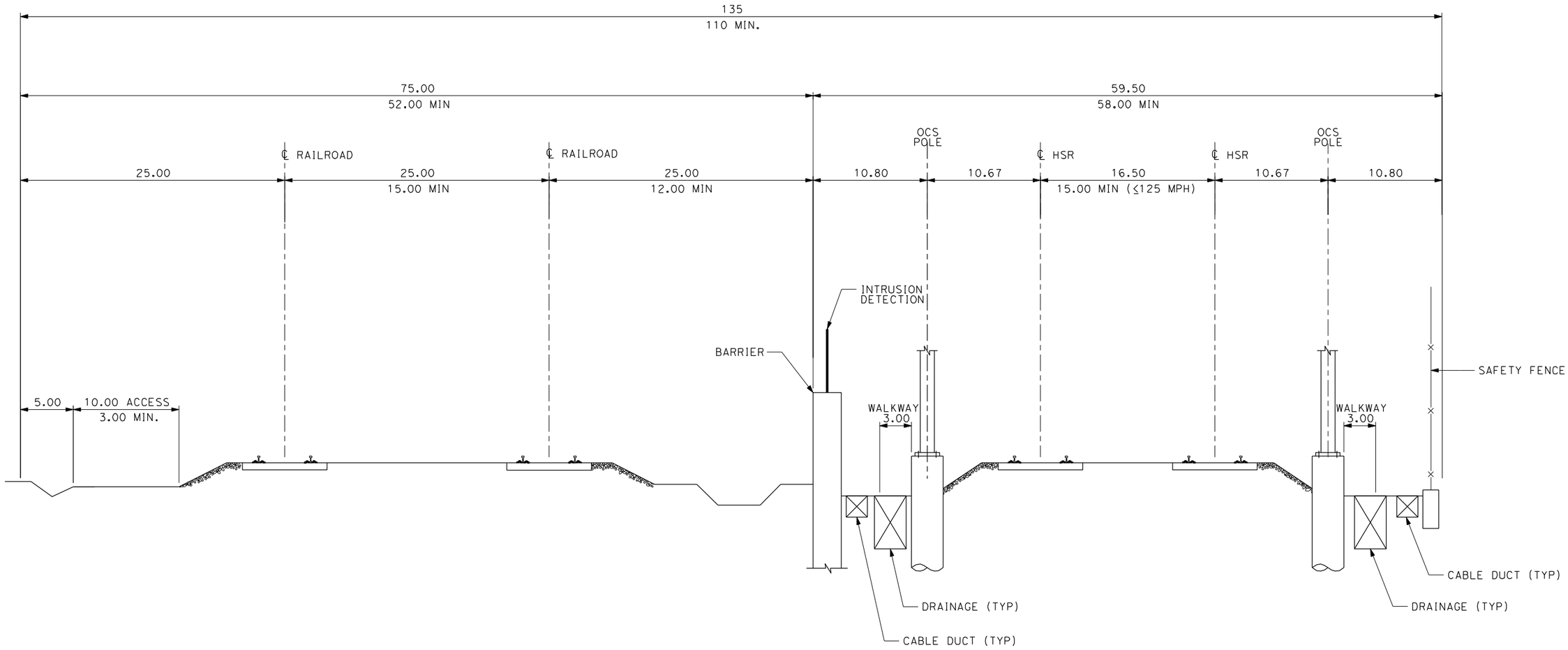
ANALYSIS	N/A
PUBLICATION/STANDARD EXTRACTS	TM1.1.21 Rev 0 – Typical Cross Sections for 15% Design, Drawing C0303 Memo – Clearances to conventional railroads, UPRR ROW, HST bridge piers, and highways, Drawing 1 – TM reference number not available Draft TM 2.1.7 Rev 1 – Rolling Stock and Vehicle Intrusion Protection for High-Speed Rail and Adjacent Transportation Systems, Appendix A
RISK ASSESSMENT	N/A
DRAWINGS	Alignment Plans & Profiles and cross-sections, Drawing TT-D3006 Utilities, Drawing UT-C4041
CALCULATIONS	N/A
EXPERT TESTIMONIALS	N/A
CORRESPONDENCE	As per DV List submitted as part of the Record Set 15% Design (July 2011)
OTHER	N/A

Appendix A – Design Standards Extracts

Extract 1: TM 1.1.21 Rev 0 – Typical Cross Sections for 15% Design, Drawing C0303

Extract 2: The Memo – Clearances to conventional railroads, UPRR ROW, HST bridge piers, and highways, Drawing – HSR in shared corridor at-grade, and Drawing – HSR in shared corridor with UPRR at-grade

Extract 3: Draft TM 2.1.7 Rev 1 – Rolling Stock and Vehicle Intrusion Protection for High-Speed Rail and Adjacent Transport Systems, Appendix A



TYPICAL SECTION
HSR IN RAIL - SHARED CORRIDOR

NOTES:

1. TRACK, OCS POLES AND FOUNDATIONS, CABLE DUCTS AND DRAINAGE ARE SCHEMATIC AND DO NOT REPRESENT DESIGN.
2. DRAINAGE MANHOLES AND OCS FOUNDATIONS ARE OFFSET ALONG TRACK IN PLAN VIEW.
3. RIGHT-OF-WAY REQUIRED FOR THE HIGH-SPEED RAIL GUIDEWAY WILL DEPEND UPON CONDITIONS ALONG THE ALIGNMENT, INCLUDING TERRAIN, WHERE CUT/FILL SLOPES, RETAINING STRUCTURES, AND ACCESS ARE REQUIRED.

5 0 5 10
1"=5'

REV	DATE	BY	SUB	APP	DESCRIPTION
					INTERNAL DRAFT

DESIGNED BY D. RULENS
DRAWN BY A. CHEUNG
CHECKED BY J. CHIRCO
IN CHARGE K. JONG
DATE 4-01-09

REGIONAL ENGINEERING CONSULTANT / LOGO

CALIFORNIA HIGH-SPEED RAIL AUTHORITY
FLYCALIFORNIA
Without ever leaving the ground.

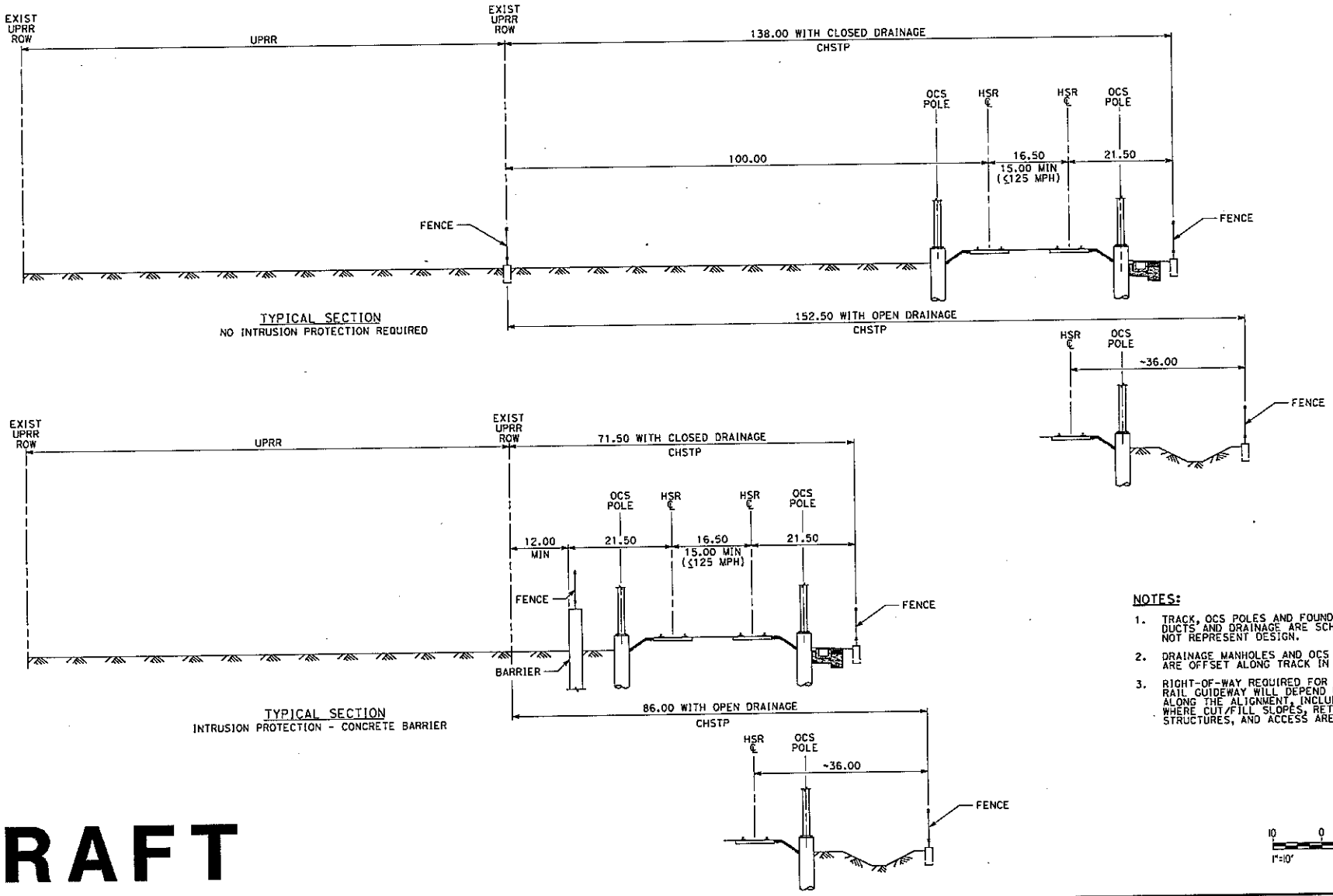
CALIFORNIA HIGH-SPEED TRAIN PROJECT

HSR - SHARED CORRIDOR
AT-GRADE

CONTRACT NO. 13259
DRAWING NO. C0303
SCALE AS SHOWN
SHEET NO. ### OF ###

HSR 13-06 - EXECUTION VERSION

4/3/2009 1:38:23 PM T:\13259B Calif High Speed Rail\CADD\Updated Figures\Cross Sections\PRO-C-0303.dgn cheung



NOTES:

1. TRACK, OCS POLES AND FOUNDATIONS, CABLE DUCTS AND DRAINAGE ARE SCHEMATIC AND DO NOT REPRESENT DESIGN.
2. DRAINAGE MANHOLES AND OCS FOUNDATIONS ARE OFFSET ALONG TRACK IN PLAN VIEW.
3. RIGHT-OF-WAY REQUIRED FOR THE HIGH-SPEE RAIL GUIDEWAY WILL DEPEND UPON CONDITION ALONG THE ALIGNMENT, INCLUDING TERRAIN, WHERE CUT/FILL SLOPES, RETAINING STRUCTURES, AND ACCESS ARE REQUIRED.

10 0 10 20
1"=10'

DRAFT

REV	DATE	BY	CHK	APP	DESCRIPTION

DESIGNED BY
DRAWN BY
CHECKED BY
IN CHARGE
DATE

PB PARSONS BRINCKERHOFF

CALIFORNIA HIGH-SPEED RAIL AUTHORITY
FLY CALIFORNIA
Without ever leaving the ground.

CALIFORNIA HIGH-SPEED TRAIN PROJECT

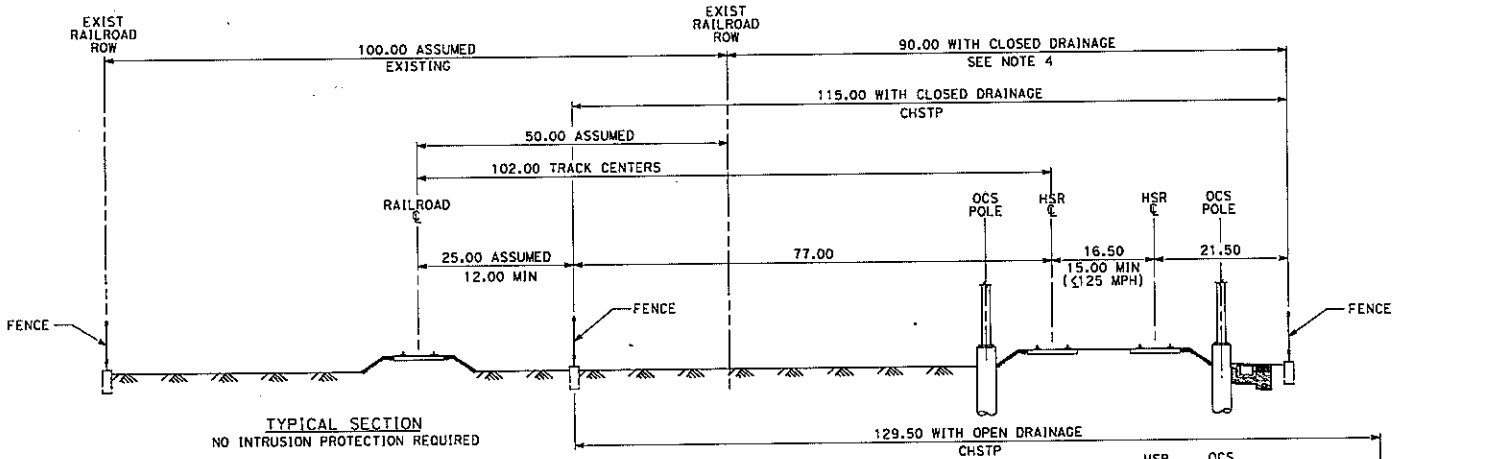
HSR IN SHARED CORRIDOR WITH UPRR

AT-GRADE

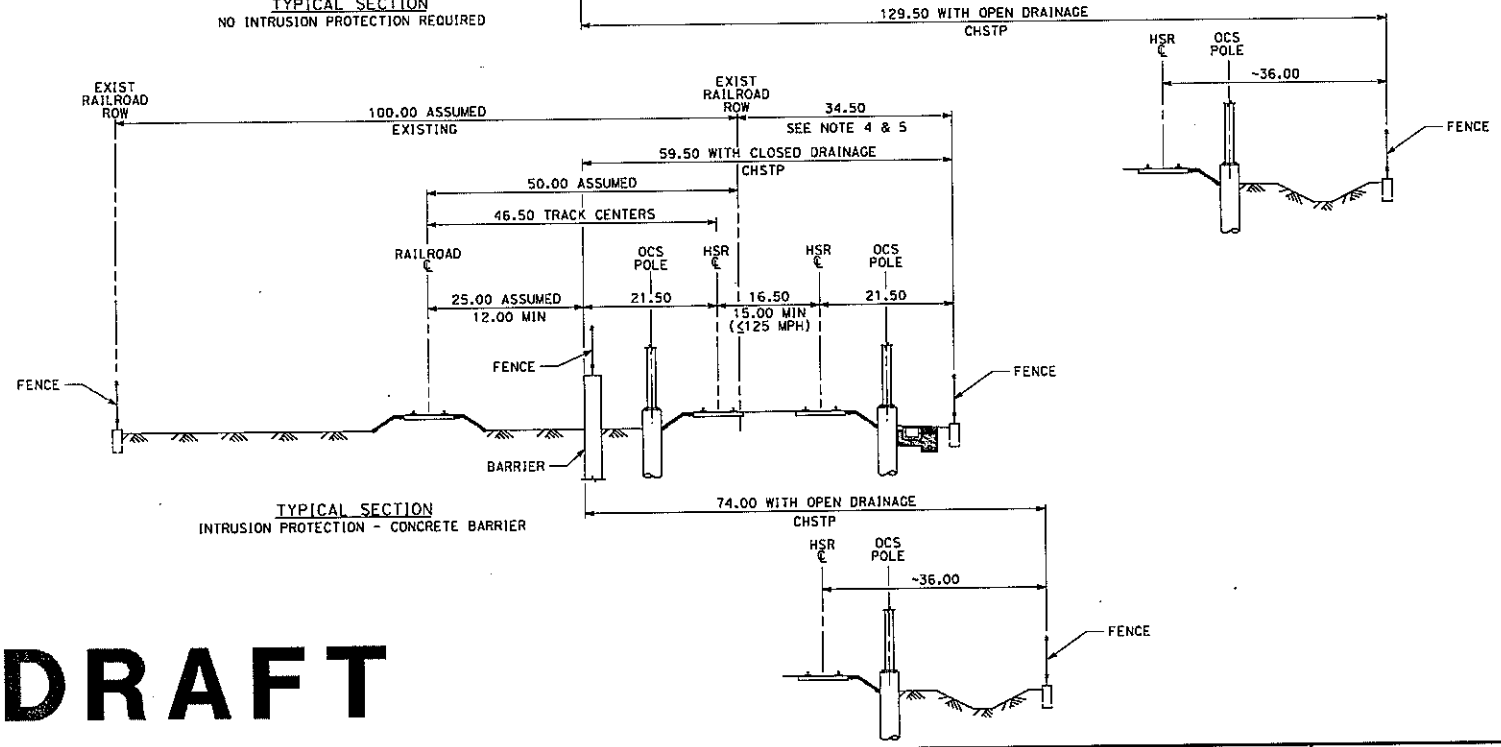
CONTRACT NO.
DRAWING NO.
SCALE 1"=10'-
SHEET NO.

8/30/2010 2:25:16 PM C:\Users\JGO\Desktop\Shared Corridor\HSR in shared corridor-2.dgn

JGO



TYPICAL SECTION
NO INTRUSION PROTECTION REQUIRED



TYPICAL SECTION
INTRUSION PROTECTION - CONCRETE BARRIER

NOTES:

1. TRACK, OCS POLES AND FOUNDATIONS, CABLE DUCTS AND DRAINAGE ARE SCHEMATIC AND DO NOT REPRESENT DESIGN.
2. DRAINAGE MANHOLES AND OCS FOUNDATIONS ARE OFFSET ALONG TRACK IN PLAN VIEW.
3. RIGHT-OF-WAY REQUIRED FOR THE HIGH-SPEED RAIL GUIDEWAY WILL DEPEND UPON CONDITIONS ALONG THE ALIGNMENT, INCLUDING TERRAIN, WHERE CUT/FILL SLOPES, RETAINING STRUCTURES, AND ACCESS ARE REQUIRED.
4. ASSUMES RAILROAD ℄ IS 50.00 FROM EXIST RAILROAD ROW.
5. ASSUMES RAILROAD ℄ IS 25.00 FROM BARRIER.

10 0 10 20
1"=10'

DRAFT

REV	DATE	BY	CHK	APP	DESCRIPTION

DESIGNED BY
DRAWN BY
CHECKED BY
IN CHARGE
DATE

PB PARSONS BRINCKERHOFF

CALIFORNIA HIGH-SPEED RAIL AUTHORITY
FLY CALIFORNIA
Without ever leaving the ground.

CALIFORNIA HIGH-SPEED TRAIN PROJECT

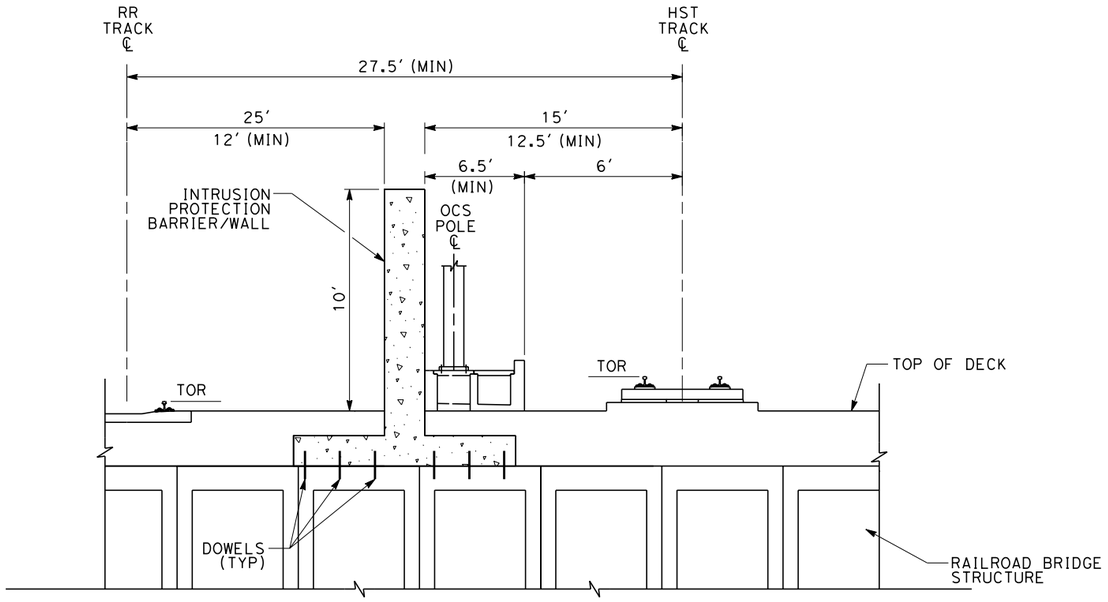
HSR IN SHARED CORRIDOR

AT-GRADE

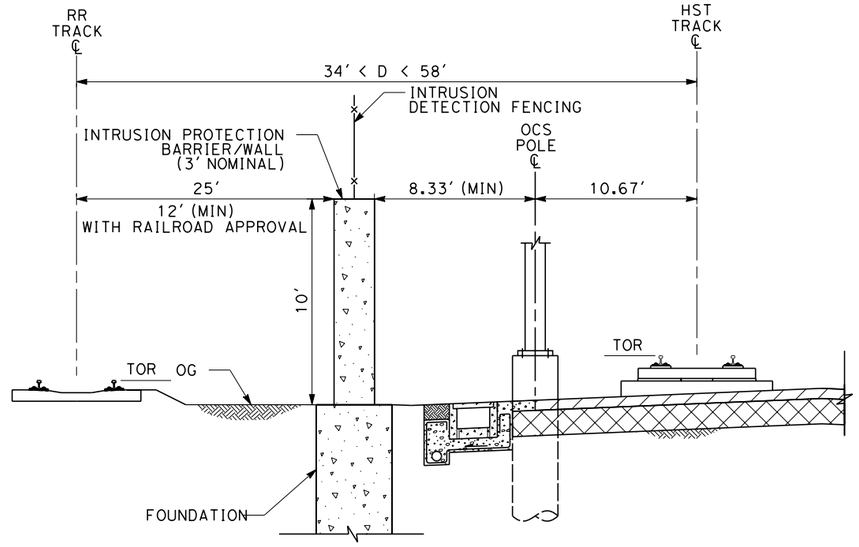
CONTRACT NO.
DRAWING NO.
SCALE 1"=10'-0"
SHEET NO.

8/30/2010 2:21:54 PM C:\Users\JCO\Desktop\Shared Corridor-VHSR in shared corridor-2.cgn

JCO



ELEVATED SHARED CORRIDOR



AT-GRADE SHARED CORRIDOR

INTERNAL DRAFT

REV	DATE	BY	CHK	APP	DESCRIPTION
					INTERNAL DRAFT

DESIGNED BY A. ABTAHI
DRAWN BY D. SO
CHECKED BY S. MILITELLO
IN CHARGE J. CHIRCO
DATE 04/29/11

PARSONS BRINCKERHOFF

CALIFORNIA HIGH-SPEED RAIL AUTHORITY

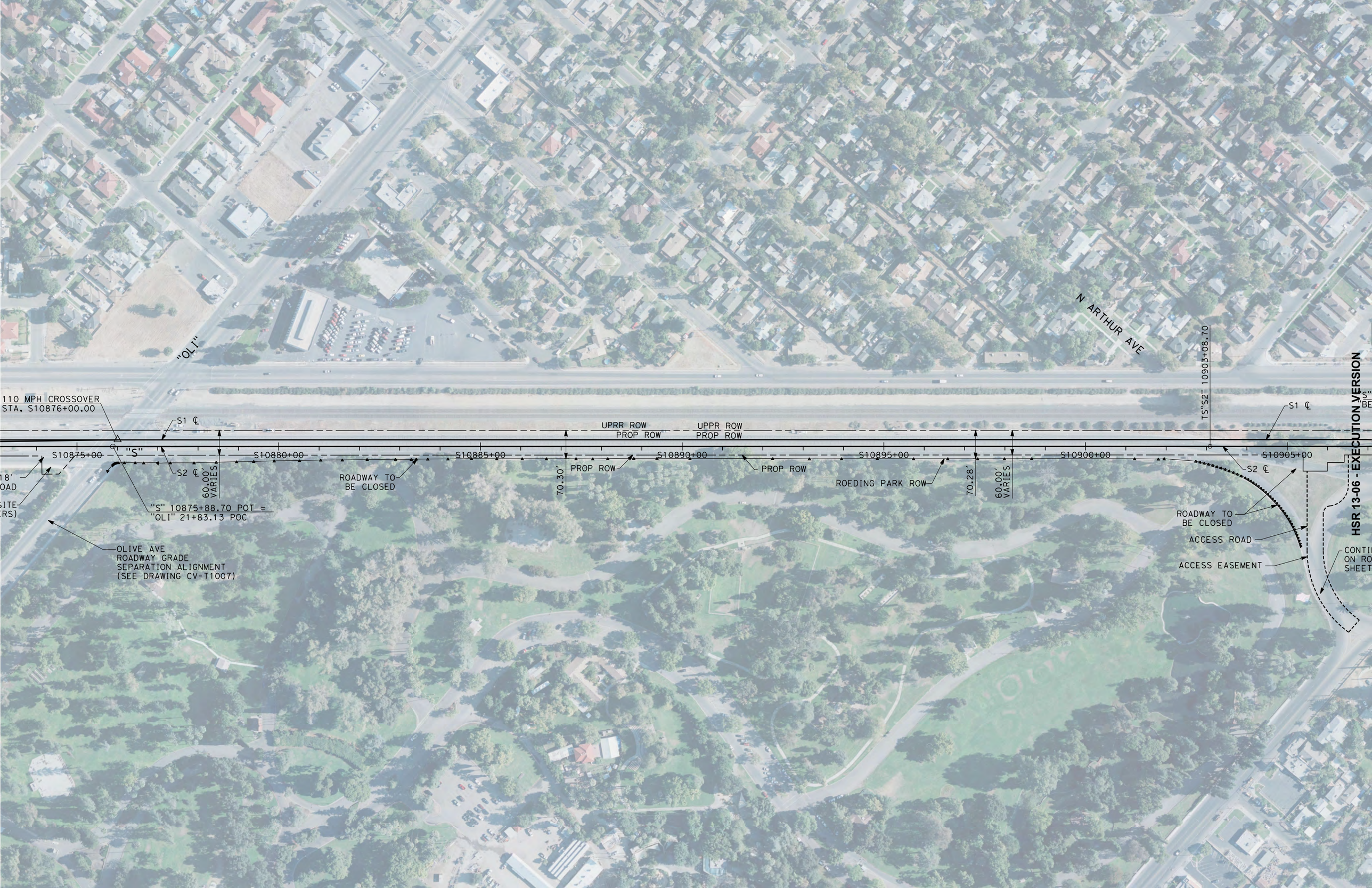
CALIFORNIA HIGH-SPEED TRAIN PROJECT
TECHNICAL MEMORANDUM

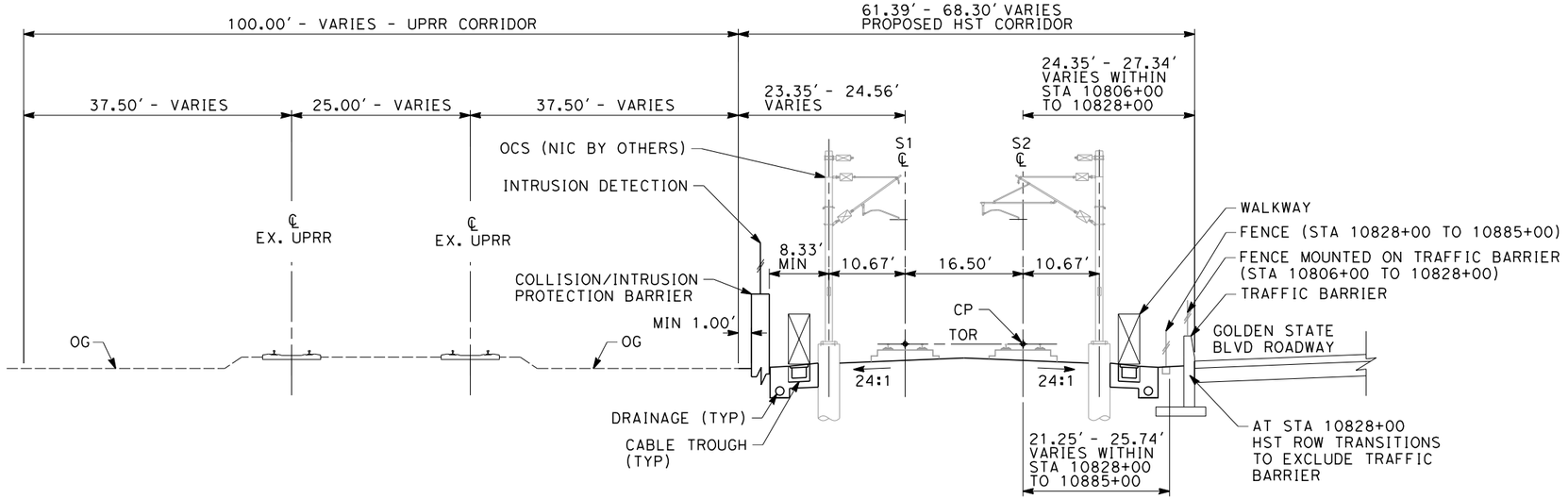
INTRUSION PROTECTION
BARRIERS IN SHARED CORRIDOR

CONTRACT NO. 13259
DRAWING NO. TM 2.1.7-B
SCALE NO SCALE
SHEET NO.

HSR 13-06 - EXECUTION VERSION

Appendix B – Alignment Plan Layout and Cross-Section


"OLI"
N ARTHUR AVE
110 MPH CROSSOVER
STA. S10876+00.00
S1 ℄
S10875+00
S10880+00
S10885+00
S10890+00
S10895+00
S10900+00
S10905+00
S2 ℄
60.00'
VARIES
UPRR ROW
PROP ROW
UPPR ROW
PROP ROW
70.30'
70.28'
PROP ROW
PROP ROW
ROADWAY TO
BE CLOSED
ROEDING PARK ROW
TS"S2" 10903+08.70
"S" 10875+88.70 POT =
"OLI" 21+83.13 POC
OLIVE AVE
ROADWAY GRADE
SEPARATION ALIGNMENT
(SEE DRAWING CV-T1007)
ROADWAY TO
BE CLOSED
ACCESS ROAD
ACCESS EASEMENT
HSR 13-06 - EXE
CONTI
ON RO
SHEET

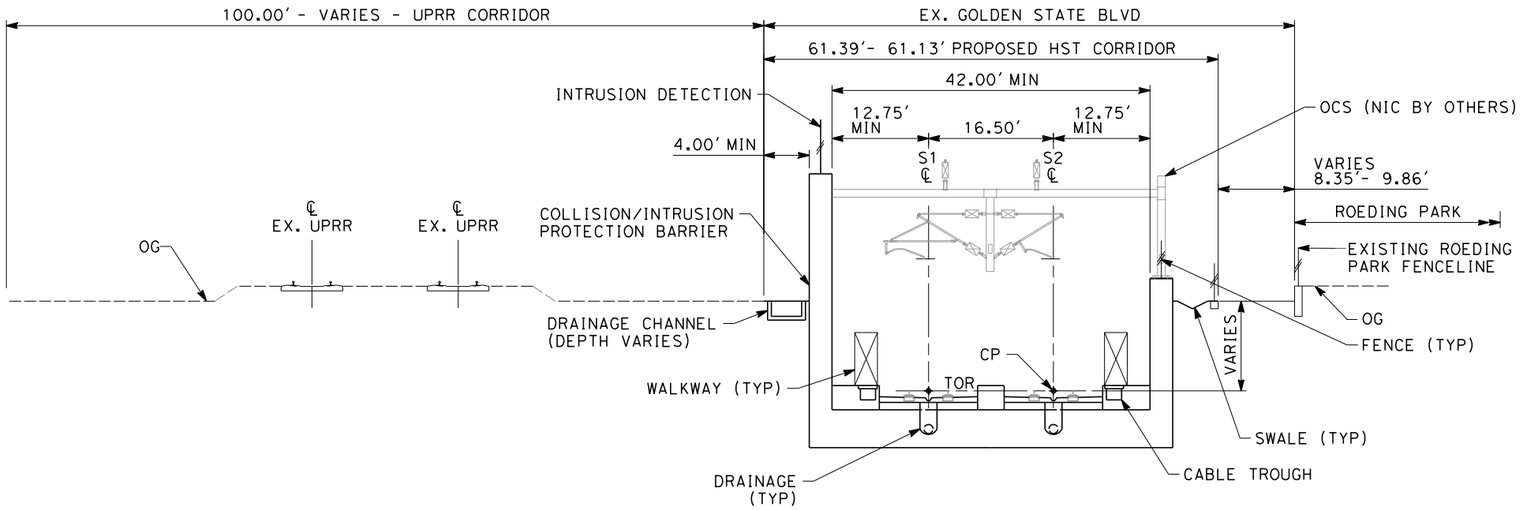


SECTION 11

"S" 10806+00 THROUGH 10885+00
TWIN TRACK AT GRADE ADJACENT TO UPRR

NOTES:

1. TRACKFORM SHOWN FOR INFORMATION ONLY (NIC BY OTHERS).
2. FOR STRUCTURE DIMENSIONS SEE STRUCTURAL TYPICAL SECTIONS.
3. SUPERELEVATION IS NOT SHOWN. THE AMOUNT OF APPLIED SUPERELEVATION IS SHOWN IN THE CURVE DATA TABLES.
4. COLLISION/INTRUSION PROTECTION BARRIER REQUIRED FROM STA 10806+00 - 10950+30



SECTION 12

"S" 10885+00 THROUGH 10902+50
TWIN TRACK IN GRADE SEPARATION ADJACENT
TO UPRR AND ROEDING PARK

10 0 10 20
1"=10'
SCALE APPLICABLE FOR FULL SIZE ONLY

REV	DATE	BY	CHK	APP	DESCRIPTION

DESIGNED BY K. SEYMOUR
DRAWN BY P. TONKIN
CHECKED BY D. HUNT
IN CHARGE R. COFFIN
DATE 12/08/11

PROPOSED PRELIMINARY DESIGN

NOT FOR CONSTRUCTION

URS | HMM | ARUP
CALIFORNIA HIGH-SPEED TRAIN

CALIFORNIA
HIGH-SPEED RAIL AUTHORITY

CALIFORNIA HIGH-SPEED TRAIN PROJECT
SIERRA SUBDIVISION
PACKAGE 1A
TRACK GUIDEWAY
TYPICAL SECTIONS

CONTRACT NO.
DRAWING NO. TT-D3006
SCALE AS SHOWN
SHEET NO.

HSR 13-06 - EXECUTION VERSION

Appendix C – Potential Storm Drain Relocation

UTILITY INFORMATION

NO.	FACILITY	SIZE	OWNER	DISPOSITION
1	OH TELECOM	NA	UNKNOWN	RELOCATE
2	SEWER	8" TO 10"	CITY OF FRESNO	RELOCATE
3	GAS	16"	PG&E	REMOVE
4	OH POWER	UNKNOWN	PG&E	RELOCATE
5	STORM DRAIN	15" TO 96"	FMFCD	RELOCATE
6	GAS	16"	PG&E	PROPOSED
7	RECYCLED WATER	12"	CITY OF FRESNO	FUTURE (BY OTHERS)
8	WATER	8" TO 12"	CITY OF FRESNO	RELOCATE
9	STORM DRAIN	18"	CITY OF FRESNO	FUTURE (BY OTHERS)
10	SEWER	8"	CITY OF FRESNO	REMOVE

MATCH LINE (UT-C4052)

N ADOLINE AVE

N ARTHUR AVE

N VAGEDES AVE

N WEBER AVE

SEE UTILITY PROTECTION AND RELOCATION PLANS FOR DETAILS

BIKE LANE

UPRR

N GOLDEN STATE BLVD

N MCKEL DR

"S"

PROP ROW

MATCH LINE (UT-C4040)

MATCH LINE (UT-C4042)

S1 ℄

S2 ℄

S10900+00

S10905+00

S109

SURFACE DRAINAGE POINT OF CONNECTION

POTENTIAL COMMUNICATION SITE (NIC BY OTHERS)

ACCESS EASEMENT

ROEDING PARK

MATCH LINE (UT-C4051)

50 0 50 100

1"=50' HOR

SCALE APPLICABLE FOR FULL SIZE ONLY

REV	DATE	BY	CHK	APP	DESCRIPTION

DESIGNED BY C. ALLEN
DRAWN BY C. DOEHNE
CHECKED BY M. POLISCHUK
IN CHARGE J. LABANOWSKI
DATE 12/08/11

PROPOSED PRELIMINARY DESIGN

NOT FOR CONSTRUCTION

URS | HMM | ARUP
CALIFORNIA HIGH-SPEED TRAIN

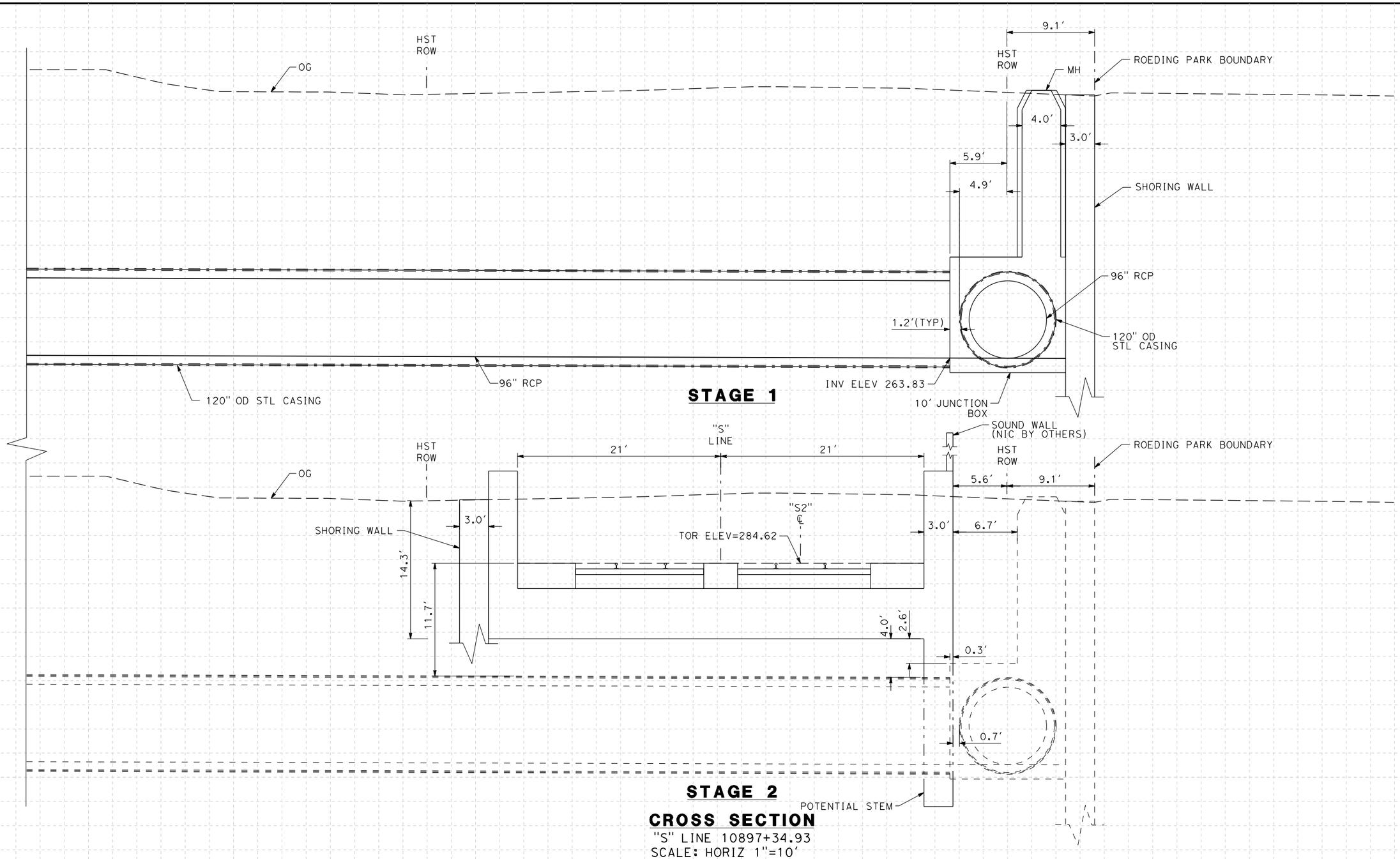
CALIFORNIA HIGH-SPEED RAIL AUTHORITY

CALIFORNIA HIGH-SPEED TRAIN PROJECT
SIERRA SUBDIVISION
PACKAGE 1A
UTILITIES
COMPOSITE UTILITY PLAN
STA. 10895+00 TO STA. 10910+00

CONTRACT NO.
DRAWING NO. UT-C4041
SCALE AS SHOWN
SHEET NO.

HSR 13-06 - EXECUTION VERSION

mark_polischuk 12/8/2011 10:53:32 AM CAHSRP-r1.tbl CHSR_PDF_half_black.plt P:\27560808\03-RPLANS\MASTERS\30% Procurement\Sheet Files\Package #1\UTC\FB-UT-C4041-PK1A.dgn



STAGE 1

STAGE 2

CROSS SECTION

"S" LINE 10897+34.93
SCALE: HORIZ 1"=10′
VERT 1"=10′

STATION		TOTAL
CY	Exc	
	Emb	

URS | HMM | ARUP
CALIFORNIA HIGH-SPEED TRAIN

CALIFORNIA
HIGH-SPEED RAIL AUTHORITY

CALIFORNIA HIGH-SPEED TRAIN PROJECT
FRESNO TO BAKERSFIELD
CROSS SECTION
ALTERNATIVE 1
"S" LINE 10897+34.93

DRAWN BY: C. ALLEN
CHECKED BY: J. LABANOWSKI
DATE: 12/01/11

HSR 13-06 - EXECUTION VERSION

carlton_allen 12/16/2011 12:01:54 PM 10897+34_1.dgn

California High-Speed Train Project

DESIGN VARIANCE COVER SHEET

Design Variance Request Number: URS-INF-2-0003

Design Variance Request Title: Vertical Element Lengths within Fresno Grade Separation

Prepared by:

URS/HMM/Arup a Joint Venture Company	29 Mar 2012
Regional Consultant	Date

PMT Review:

Richard Schmedes	7 Nov 2011
Systems	Date
John Chirco	15 May 2012
Infrastructure	Date
Joseph Metzler	4 June 2012
Operations/Maintenance/Safety	Date
Frank Banko	16 Feb 2012
Rolling Stock	Date
Vladimir Kanevsky	3 Nov 2011
Regulatory Approvals	Date
Tony Murphy	18 Nov 2011
System Integration	Date

PMT Recommended:

Thomas Tracy	5 Jun 2012
PMT Regional Manager	Date

PMT Approval:

Ken Jong	5 Jun 2012
Engineering Manager	Date

Agency Concurrence:

CHSR Authority Chief Engineer	Date

CHST DESIGN VARIANCE REQUEST FORM

Part 1 – Design Variance Request Information

Title/Subject: Vertical Element Lengths within Fresno Grade Separation

Number: URS-INF-2-0003 **Revision:** 0

Contract Name & Number (Final Design): HSR 06-0003

Region: Fresno to Bakersfield

Location: Fresno

Regional Consultant's / Third Party Design Drawing Reference:

Date Submitted to RMT & PMT

PREPARED / SUBMITTED BY: NAME: Richard Coffin COMPANY: URS/HMM/Arup A Joint Venture Company SIGNATURE: DATE: 3/29/12	 (Engineering Seal)

**Note design variance numbers will follow the same convention:* "ABC" will abbreviate the name of the firm submitting the variance, "DEF" abbreviates the name of firm receiving the variance request, "X" is the revision number starting from 0, and the last four numbers count the number of total submittals staring from one.

Part 2 – Design Variance Request Information

CHSTP DESIGN REQUIREMENT Include reference to drawings, design criteria, technical memos, specifications	TM 2.1.2 Rev 0 – Alignment Standards for High-Speed Train Operations
DESIGN CRITERIA REQUIRING A VARIANCE	The design speed of the two vertical curves between (STA 10878+82 to 10941+75) would be reduced from 250mph to 220mph. The maximum operating speed of 220mph will not be affected; however, future operating speeds of up to 250mph would be precluded. The vertical curve lengths of 2,000ft and 3,300ft are within exceptional criteria as defined in Section 6.1.6. Vertical curve overlap with horizontal spiral defined in Section 6.1.7.
REASON FOR REQUESTING A VARIANCE	The San Joaquin Valley Railroad (SJVR), Dry Creek Canal, and SR-180 all exist within close proximity in North Fresno (between STA 10934+00 and 10940+00). The SJVR is at grade with Dry Creek Canal passing approximately 10ft below and SR-180 elevated approximately 30ft above. An at-grade high-speed train (HST) alignment would require severance of the SJVR connection to the Union Pacific Railroad (UPRR) or a grade separation of the SJVR spur with extensive works to reconnect to the UPRR mainline. Both would require extensive schedule extensions to gain the necessary agreements. There is insufficient clearance to pass HST alignment between SJVR and SR-180. Elevating above SR-180 requires a viaduct approximately 65ft in height and has been discounted during the 15% design process. The HST alignment is therefore to be grade separated below all existing crossings. The existing SJVR bridge over Dry Creek Canal has a shallow construction depth. To replace the bridge while maintaining current water levels, the SJVR is to be raised approximately 3ft. Dry Creek Canal cannot be closed or permanently diverted. Minimizing the impact of the HST trench requires the alignment vertical curves and straights to be as short as practicable.
JUSTIFICATION FOR VARIANCE	The proposed design (red line — within exceptional alignment criteria at 220mph) minimizes the extents of trench and the distance between the

	proposed station and crossovers. The trench is 7,940ft long with a maximum depth of 42ft.The vertical curves are 2,000ft and 3,300ft long, respectively, and are approximately midrange between minimum criteria and exceptional criteria. The connecting straight meets minimum criteria. The distance between the station and the crossovers requires a design variance and will be made worse by the minimum (green line) and desirable (blue line) vertical alignments. Options for a 220mph desirable vertical alignment and a 220mph minimum vertical are shown in Appendix A. Significant differences to the proposed scheme are detailed below. **Impacts of the 220mph desirable trench (blue line):** A 220mph alignment that meets the desirable criteria would also allow for 250mph at minimum criteria. The total length of trench is 11,680ft with a maximum depth of 54ft. The crossovers are moved a further 3,060ft away from the station. This significantly worsens the crossover to station distance design variance. **Impacts of the 220mph minimum trench (green line):** The total length of trench is 9,700ft with a maximum depth of 48ft. The crossovers are moved a further 1,410ft away from the station. This worsens the crossover to station distance design variance. The preceding vertical curve at STA 10836+14 is moved north 1,400ft to create sufficient length for the crossovers. This has no significant impact.
PROPOSED ALTERNATIVE DESIGN REQUIREMENT	The proposed 220mph exceptional (red line) alignment represents a balance between achieving the minimum criteria and minimizing crossover to station distance and trench length.

	Summary of options: Option / Speed (mph) / Length (ft) / Criteria Blue / 220 / VC1=2400 / Desirable / / STR=1475 / Desirable / / VC2=5300 / Desirable Green / 220 / VC1= 2500 / Minimum / / STR=858 / Minimum / / VC2=4350 / Minimum Red / 220 / VC1= 2000 / Exceptional / / STR=993 / Minimum / / VC2=3300 / Exceptional **Overlap of vertical curve and horizontal spiral:** The location of the vertical curve is constrained by the requirement to pass under the existing structure at SR-99, the proposed Dry Creek culvert and the SJVR. The overlap between the elements is approximately 3,440ft for the red line and 4,000ft for the blue and green lines. Extending the straight approaching the station back through the horizontal curves and spirals would create a trench in excess of 100ft deep. This is shown by an orange dashed line in the appended drawings. This is considered unreasonable.

Part 3 – Impact Analysis

OPERATIONS	The Authority's operations team should analyze the impact of moving the crossovers further from the station. The 220mph exceptional alignment precludes the ability to increase operating speeds up to 250mph in the future. Passenger comfort will be adversely affected by the greater vertical forces and shorter duration between crest and sag.
MAINTENANCE	The reduced vertical curve radii may increase the maintenance requirements through increased rail wear. The shorter and shallower trench may reduce structure maintenance expenses.
INFRASTRUCTURE	The exceptional (red line) alignment requires a shorter and shallower trench structure.
RAILROAD SYSTEMS	None identified
RELIABILITY / FUNCTIONALITY	None identified
THIRD PARTY (Utility, Freight, Caltrans, RR, other)	None identified

SAFETY AND SECURITY	The proposed design is within acceptable range for exceptional radii in the design standards. Therefore the design would not pose a safety risk above those accepted in the design standards.
DIRECT COST	The overall cost has not been assessed; however, it is clear that the 220mph desirable (blue line) option would increase the construction quantities compared to the exceptional design through the increased length and depth of the trench structure. The 220mph minimum (green line) would increase the construction quantities to a lesser degree.
OTHER	None identified

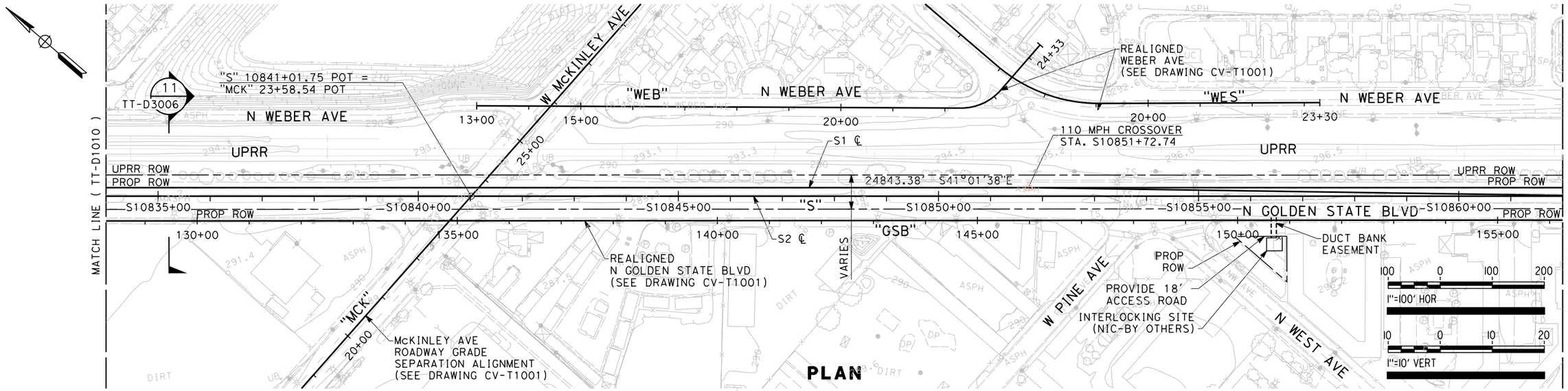
Part 4 – Mitigation measures

OPERATIONS	The exceptional (red line) alignment has the least operational impact due to minimizing the crossovers to station distance. The Authority's operations team should perform an analysis to determine the value of minimizing the crossover to station distance.
MAINTENANCE	The curve lengths are not the absolute exceptional values. They represent a balance between trench cost and crossover to station distance against track maintenance requirements.
INFRASTRUCTURE	Increased inspection may mitigate maintenance issues.
RAILROAD SYSTEMS	None identified

Part 5 – List of Supporting Documentation to Design Variance Request

ANALYSIS	N/A
PUBLICATION/STANDARD EXTRACTS	TM 2.1.2 Rev 0 – Alignment Standards for High-Speed Train Operations TM 2.1.3 Rev 0 – Turnout and Station Tracks
RISK ASSESSMENT	N/A
DRAWINGS	Alignment plan and profile drawings
CALCULATIONS	N/A
EXPERT TESTIMONIALS	N/A
CORRESPONDENCE	N/A
OTHER	N/A

Appendix A – Option Layouts



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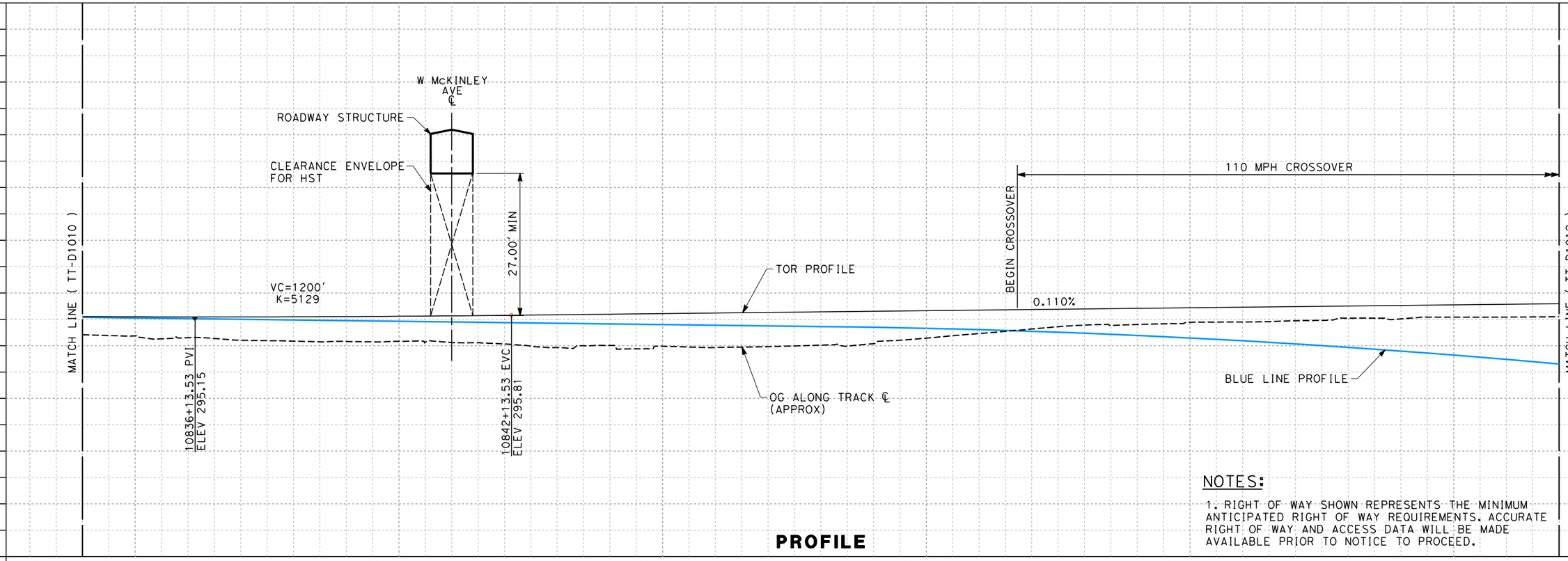


PROFILE

NOTES:

1. RIGHT OF WAY SHOWN REPRESENTS THE MINIMUM ANTICIPATED RIGHT OF WAY REQUIREMENTS. ACCURATE RIGHT OF WAY AND ACCESS DATA WILL BE MADE AVAILABLE PRIOR TO NOTICE TO PROCEED.

REV	DATE	BY	CHK	APP	DESCRIPTION

DESIGNED BY K. SEYMOUR
DRAWN BY P. TONKIN
CHECKED BY D. HUNT
IN CHARGE R. COFFIN
DATE 12/08/11

PROPOSED PRELIMINARY DESIGN

NOT FOR CONSTRUCTION

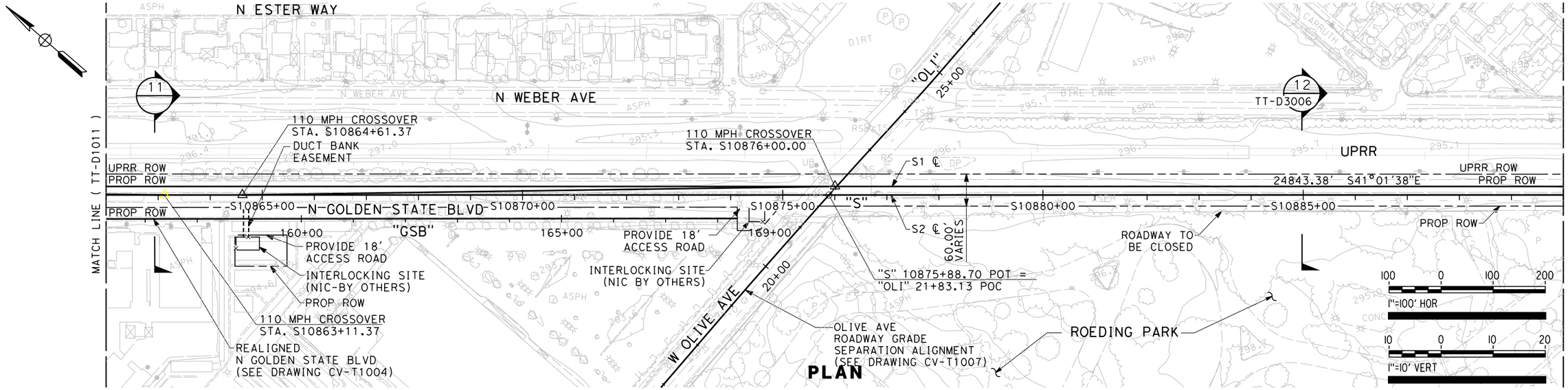
URS | HMM | ARUP
CALIFORNIA HIGH-SPEED TRAIN

CALIFORNIA HIGH-SPEED RAIL AUTHORITY

CALIFORNIA HIGH-SPEED TRAIN PROJECT
SIERRA SUBDIVISION
PACKAGE 1A
TRACK GUIDEWAY
PLAN AND PROFILE
STA. 10834+00 TO STA. 10862+00

CONTRACT NO.
DRAWING NO. TT-D1011
SCALE AS SHOWN
SHEET NO.

HSR 13-06 - EXECUTION VERSION



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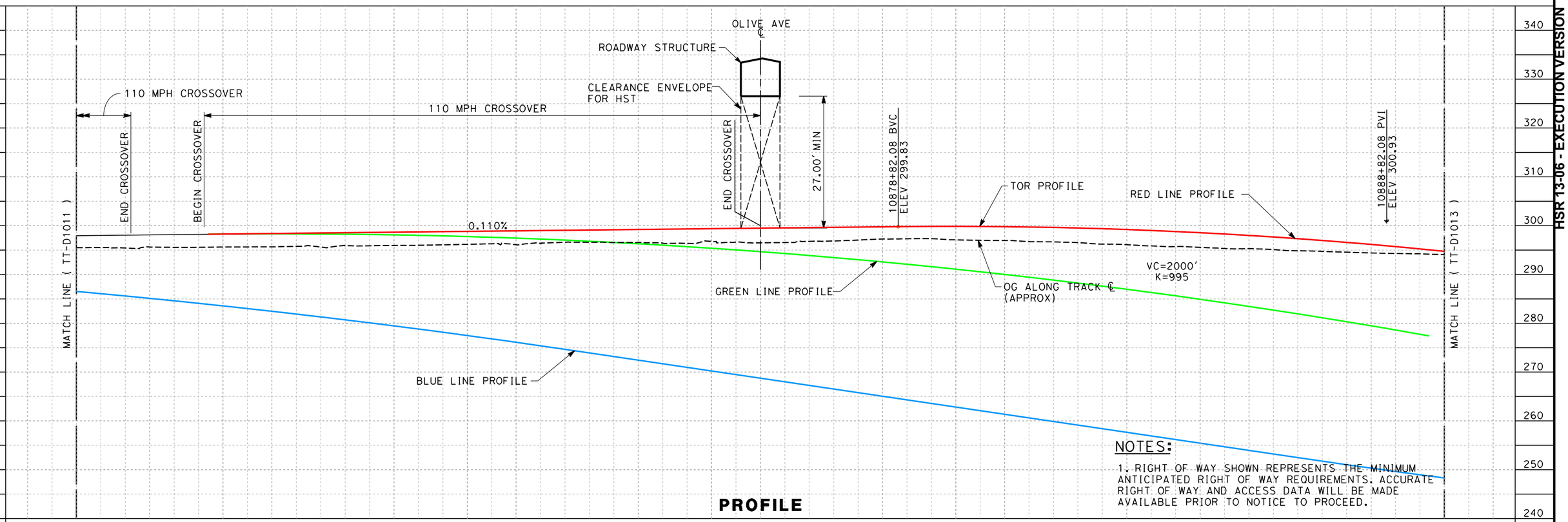


PROFILE

NOTES:

1. RIGHT OF WAY SHOWN REPRESENTS THE MINIMUM ANTICIPATED RIGHT OF WAY REQUIREMENTS. ACCURATE RIGHT OF WAY AND ACCESS DATA WILL BE MADE AVAILABLE PRIOR TO NOTICE TO PROCEED.

REV	DATE	BY	CHK	APP	DESCRIPTION

DESIGNED BY K. SEYMOUR
DRAWN BY P. TONKIN
CHECKED BY D. HUNT
IN CHARGE R. COFFIN
DATE 12/08/11

PROPOSED PRELIMINARY DESIGN

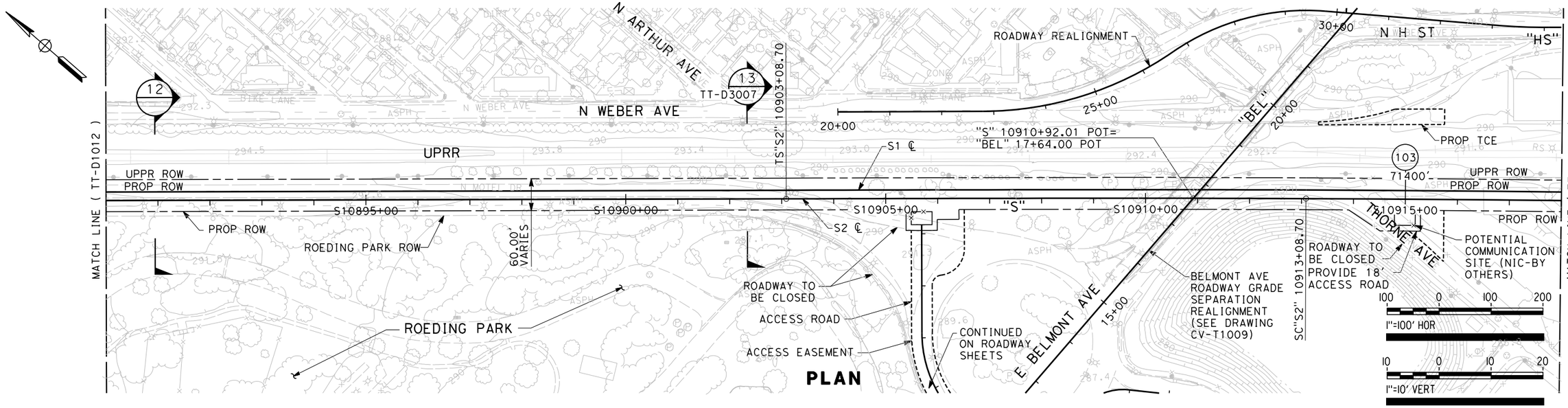
NOT FOR CONSTRUCTION

URS | HMM | ARUP
CALIFORNIA HIGH-SPEED TRAIN

CALIFORNIA HIGH-SPEED RAIL AUTHORITY

CALIFORNIA HIGH-SPEED TRAIN PROJECT
SIERRA SUBDIVISION
PACKAGE 1A
TRACK GUIDEWAY
PLAN AND PROFILE
STA. 10862+00 TO STA. 10890+00

CONTRACT NO.
DRAWING NO. TT-D1012
SCALE AS SHOWN
SHEET NO.



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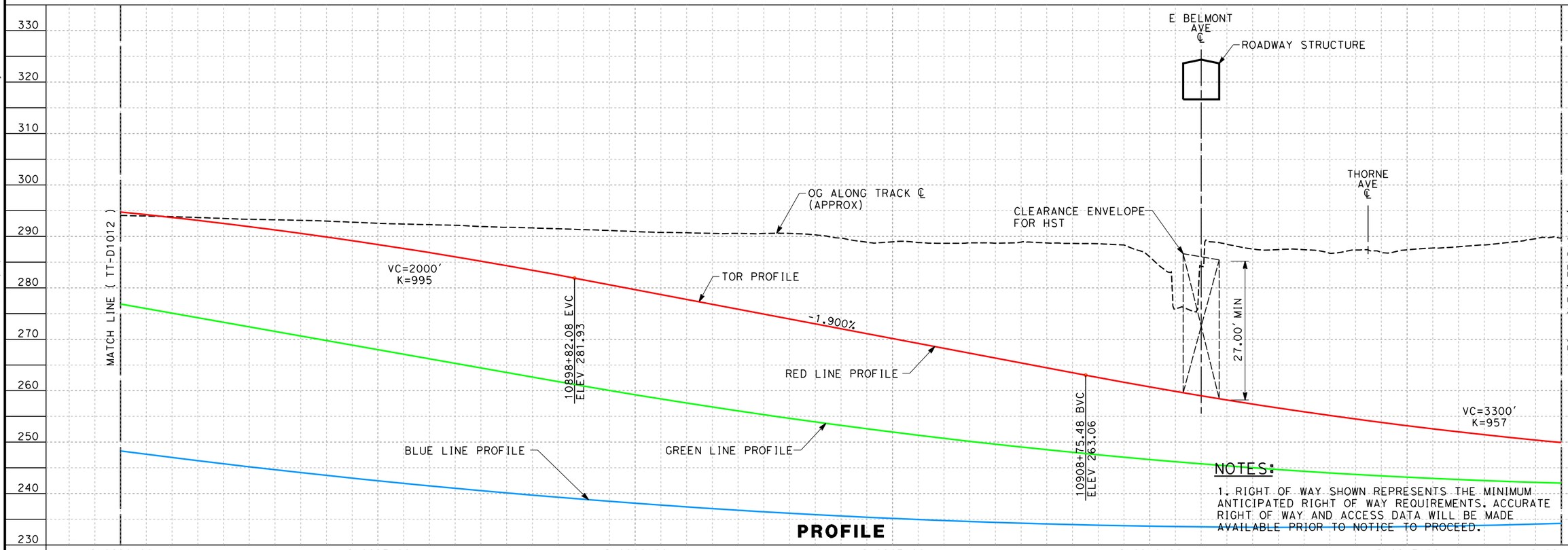


PROFILE

NOTES:

1. RIGHT OF WAY SHOWN REPRESENTS THE MINIMUM ANTICIPATED RIGHT OF WAY REQUIREMENTS. ACCURATE RIGHT OF WAY AND ACCESS DATA WILL BE MADE AVAILABLE PRIOR TO NOTICE TO PROCEED.

REV	DATE	BY	CHK	APP	DESCRIPTION

DESIGNED BY K. SEYMOUR
DRAWN BY P. TONKIN
CHECKED BY D. HUNT
IN CHARGE R. PRUST
DATE 12/08/11

PROPOSED PRELIMINARY DESIGN

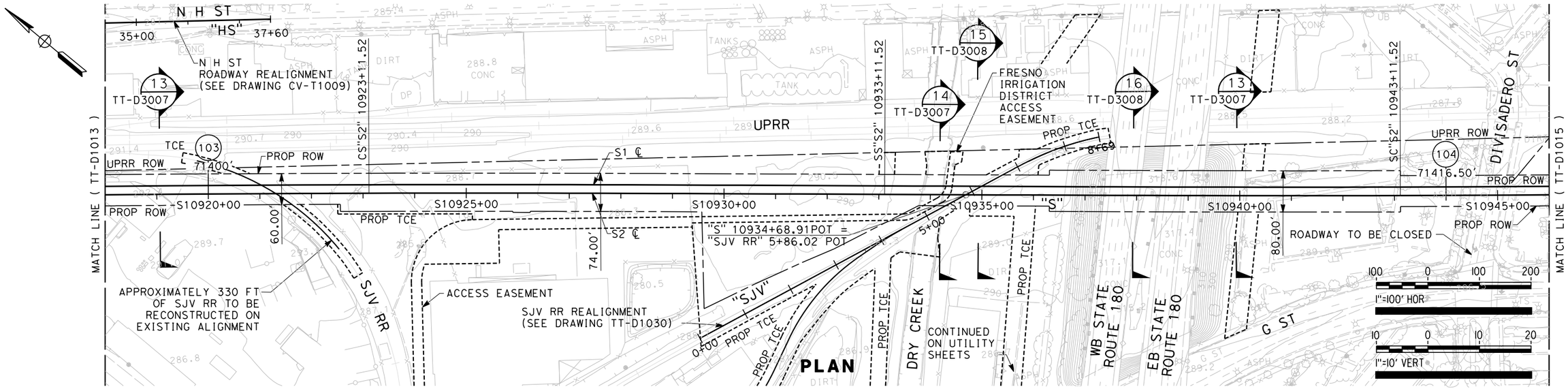
NOT FOR CONSTRUCTION

URS | HMM | ARUP
CALIFORNIA HIGH-SPEED TRAIN

CALIFORNIA HIGH-SPEED RAIL AUTHORITY

CALIFORNIA HIGH-SPEED TRAIN PROJECT
SIERRA SUBDIVISION
PACKAGE 1A
TRACK GUIDEWAY
PLAN AND PROFILE
STA. 10890+00 TO STA. 10918+00

CONTRACT NO.
DRAWING NO. TT-D1013
SCALE AS SHOWN
SHEET NO.



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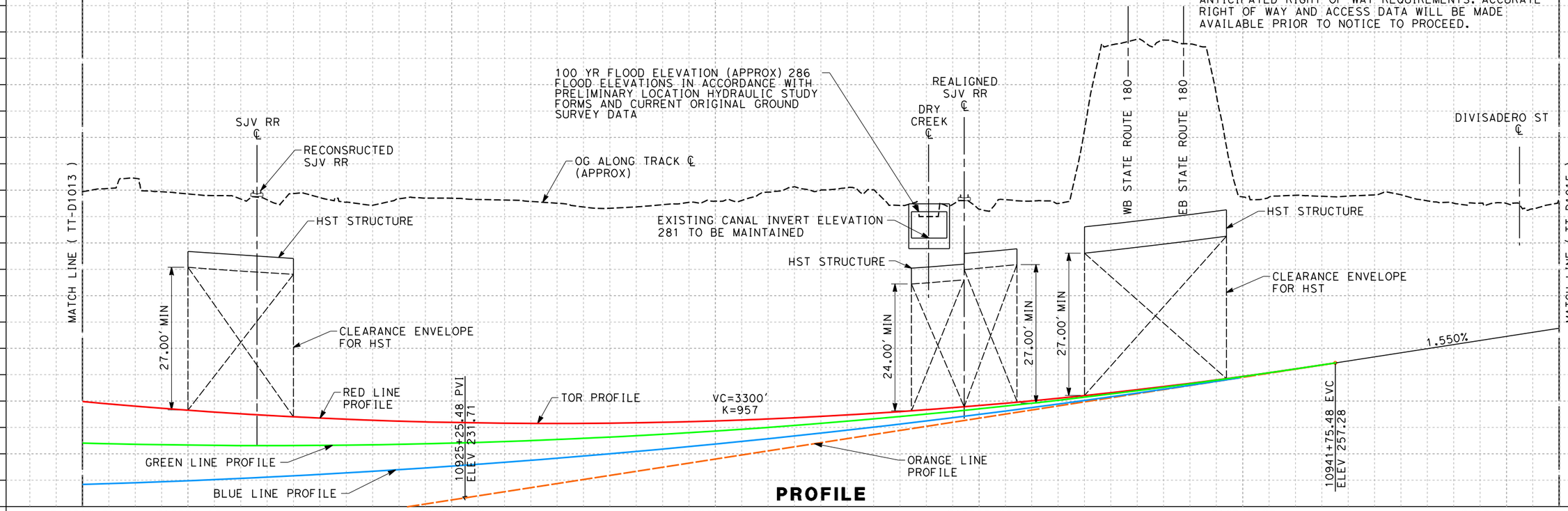


PROFILE

NOTES:

1. RIGHT OF WAY SHOWN REPRESENTS THE MINIMUM ANTICIPATED RIGHT OF WAY REQUIREMENTS. ACCURATE RIGHT OF WAY AND ACCESS DATA WILL BE MADE AVAILABLE PRIOR TO NOTICE TO PROCEED.

REV	DATE	BY	CHK	APP	DESCRIPTION

DESIGNED BY K. SEYMOUR
DRAWN BY P. TONKIN
CHECKED BY D. HUNT
IN CHARGE R. COFFIN
DATE 12/08/11

PROPOSED PRELIMINARY DESIGN

NOT FOR CONSTRUCTION

URS | HMM | ARUP
CALIFORNIA HIGH-SPEED TRAIN

CALIFORNIA HIGH-SPEED RAIL AUTHORITY

CALIFORNIA HIGH-SPEED TRAIN PROJECT
SIERRA SUBDIVISION
PACKAGE 1A
TRACK GUIDEWAY
PLAN AND PROFILE
STA. 10918+00 TO STA. 10946+00

CONTRACT NO.
DRAWING NO. TT-D1014
SCALE AS SHOWN
SHEET NO.

California High-Speed Train Project

DESIGN VARIANCE COVER SHEET

Design Variance Request Number: URS-INF-2-0004

Design Variance Request Title: Dry Creek Structure Clearance

Prepared by:

URS/HMM/Arup a Joint Venture Company	6 Oct 2011
Regional Consultant	Date

PMT Review:

Richard Schmedes	4 Jun 2012
Systems	Date
John Chirco	15 May 2012
Infrastructure	Date
Joseph Metzler	21 Oct 2011
Operations/Maintenance/Safety	Date
Frank Banko	12 Oct 2011
Rolling Stock	Date
Vladimir Kanevsky	3 Nov 2011
Regulatory Approvals	Date
Tony Murphy	18 Nov 2011
System Integration	Date

PMT Recommended:

Thomas Tracy	5 Jun 2012
PMT Regional Manager	Date

PMT Approval:

Ken Jong	5 Jun 2012
Engineering Manager	Date

Agency Concurrence:

CHSR Authority Chief Engineer	Date

CHST DESIGN VARIANCE REQUEST FORM

Part 1 – Design Variance Request Information

Title/Subject: 30-inch Sewer Line/Dry Creek Structure/60-inch Storm Drain Clearance

Number: URS-INF-2-0004 **Revision:** 2

Contract Name & Number (Final Design): HSR 06-0003

Region: Fresno to Bakersfield

Location: Fresno Grade Separation below Dry Creek Canal, SJVR and SR-180

Regional Consultant's / Third Party Design Drawing Reference:

Date Submitted to RMT & PMT

PREPARED / SUBMITTED BY: NAME: James Labanowski COMPANY: URS/HMM/Arup A Joint Venture Company SIGNATURE: James A. Labanowski Jr. DATE: 3/23/12	REGISTERED PROFESSIONAL ENGINEER JAMES ANGELO LABANOWSKI JR. No. C 055039 Exp. 6/30/12 CIVIL STATE OF CALIFORNIA (Engineering Seal)

**Note design variance numbers will follow the same convention:* "ABC" will abbreviate the name of the firm submitting the variance, "DEF" abbreviates the name of firm receiving the variance request, "X" is the revision number starting from 0, and the last four numbers count the number of total submittals staring from one.

Part 2 – Design Variance Request Information

CHSTP DESIGN REQUIREMENT Include reference to drawings, design criteria, technical memos, specifications	TM 2.1.2 Rev 0 – Alignment Standards for High-Speed Train Operations TM 3.2.1 Rev 1 – OCS Requirements
DESIGN CRITERIA REQUIRING A VARIANCE	Below-standard clearance of 24ft is proposed to the CHSTP structure below the proposed 30-inch sewer line (STA10933+14), the Dry Creek canal (STA10934+00) and the 60-inch storm drain (STA10935+86). This meets the standard clearance to an existing structure but does not meet the 27-foot clearance required for a new structure.
REASON FOR REQUESTING A VARIANCE	The 30-inch sewer line is currently located at STA10934+56 with an existing invert level of 273.8ft, The invert elevation needs to be maintained at the point of relocation for the system to continue to operate as a gravity system. Dry Creek is located at STA10934+00 with an existing invert level of 281ft, which is to be maintained. The 60-inch storm drain is replacing two separate drain lines at STA 10940+21 and STA10945+18 that would not meet the standard clearance to an existing structure. The relocated invert elevation of 275.7ft needs to be maintained for proper operation of the storm drain as a gravity system. CHSTP is grade separated below Dry Creek. The creek is to be culverted and is required by the PMT to be structurally independent of the proposed CHSTP structure. CHSTP is grade separated below the 30-inch sewer line and the 60-inch storm drain. Both lines will be independent of the proposed CHSTP structure. The CHSTP alignment is to be as shallow as possible to reduce the trench structure cost and the crossover distances to the proposed station.
JUSTIFICATION FOR VARIANCE	Reducing the clearance to 24ft reduces available space for the Overhead Contact System (OCS) equipment. However, 24ft clearance for short spans does not preclude the use of OCS as used for sections where 27ft clearance is provided.

	If the clearance is increased to 27ft, then either an amalgamated Dry Creek culvert/CHSTP structure or a deeper and longer trench structure will be required. The PMT has previously rejected the amalgamated structure in order to separate the maintenance and other liabilities of the canal structure from that of the CHSTP structure. Pumping stations would be necessary to lift the storm drain and sewer lines in order to gain the 27ft clearance required by the Technical Memoranda. The City of Fresno and the Fresno Metropolitan Flood Control District are both highly opposed to pump stations due to increased maintenance and associated liabilities (see Minutes of Meeting, Appendix A). The deeper and longer trench will be significantly more expensive. Deepening the trench may also require wider trench walls and therefore increased right-of-way width. The longer trench structure will lengthen the crossover to station distance. This is already a design variance and will further impact operations.
PROPOSED ALTERNATIVE DESIGN REQUIREMENT	The OCS equipment will be required to be designed such that that no supports are located under the 30-inch sewer line, the Dry Creek culvert or the 60-inch storm drain (see OCS sketches in Appendix A). This is achievable as the contact wire through the section is designed at 17ft 4.7 inches (5300 mm) and with a system height of 5ft 3 inches (1600 mm) results in the messenger wire being 22ft 7.7 inches (6900 mm) at the support structure. Given the above, in the worst case situation with the OCS structure adjacent to any of the three low clearance areas, the clearance from them to the messenger wire would be 14.3 inches (363 mm), which exceeds the required normal static clearance of 1ft 0.6 inch (320 mm). In reality the static clearance will be greater as the messenger wire will sag due to its self weight and that of the contact wire and hangers.

	The OCS equipment will be the same as required by existing structures on the route. The longitudinal negative feeder wire could be placed inside the cantilever with a minimum electrical clearance of 1ft 5.4 inches (440 mm). At the support the feeder wire does not have dynamic movement. Further electrical clearance can be achieved by placing the longitudinal feeder wire in the middle of the tracks, supported from the HST cover slab. This structure is located within a reverse horizontal spiral and vertical sag curve. This is not expected to present any significant issues. The alignment speed is 220mph. The 60 inch storm drain and the 30 inch sewer line would need to be supported across the trench using an external structure (pipe bridge). A number of options for this structure have been considered including a structural concrete encasement and steel tubular casing. Of these options, the required invert level can be achieved with a 1/2” wall thickness tubular steel casing of approx 80” diameter (for the 60” storm drain) with allowance for spacers and packing to permit withdrawal of the drainage pipe. Use of a concrete encasement would require further encroachment on the vertical clearance below 24’. In order to ensure minimum maintenance of the pipe crossings the casing would need to be protected against corrosion. 3 options have been investigated • Paint system specification Blast clean to SSPC SP10 Primer Epoxy 2 mil

	Barrier Glass flake epoxy minimum 30 to 35 mil Finish 2 mil polyurethane • Thermal Sprayed Aluminum Blast clean to SSPC SP5 Thermal sprayed Aluminum 8 to 10 mil (**Note:** this treatment is not suitable for surfaces that will be buried) • Alternate casing material Fabricate casing from Duplex Stainless Steel (Low Nickel content with high structural strength). Requires no further treatment. The durability of these alternatives varies. The "practical life" (time to the point where replacement of the coating is required) of the paint and sprayed aluminum systems is about 30 years. The practical life of the duplex stainless steel is not known and is effectively on a par with the design life of the trench structure (+100 years) All options would be subject to regular maintenance inspections (likely to be annual) by the owner of the utility. The metallic parts of the pipe crossings and the reinforcement of the concrete option would need to be grounded to earth and bonded to the OCS system to avoid dangerous potential differences. Overall we suggest that the stainless steel casing provides the most robust protection for the HST system.

Part 3 – Impact Analysis

OPERATIONS	The proposed option for the Dry Creek Culvert has no operational impact. The proposals for the pipe crossings will require operations to be interrupted to facilitate access by the utility owner to the crossing structures for: • condition inspection • replacement of the corrosion protection system The required intervals for these interruptions will need to be agreed with the utility owners. The alternative lower alignment option will increase the crossover-to-stations distance. PMT operations

	team should analyze the impact of moving the crossovers farther from the station if this is to be considered further.
MAINTENANCE	For the pipe crossings, regular condition inspections would be necessary to verify that the condition of the utility crossing is not a risk to the HST. Additionally, if painting or aluminum metal spray is chosen as the corrosion protection method for the utility casing, allowance would need to be made for stripping and replacement of the protection system at least 3 times in the expected life of the HST structure (assuming a paint system life of 30 years).
INFRASTRUCTURE	None identified
RAILROAD SYSTEMS	The AREMA Standards may be applicable to this system in the absence of any definitive guidance or technical memoranda regarding utility crossings over the HST. The AREMA standards may be regarded as a good guide to the provisions that the HST Authority would find acceptable for such crossings. The AREMA standards for utility crossings over a railway include the following requirements, paraphrased as follows: • Overhead crossings are regarded as a last resort (under-ground crossings are preferred) and Section 5.4.2.1 - requires the proposer to demonstrate due diligence in finding alternative methods of crossing before proposing an overhead crossing. • Section 5.4.2.2 – States that a pipeline facility should not be attached to a railway structure. This clarifies that the HST Authority cannot be the owner of the pipe crossing structure. Consequently, maintenance and inspection of the utility crossing and structure will be the responsibility of the utility owner. This will require access to the structure to be provided by the HST operators. • Section 5.4.3.1 To protect the HST from the effects of leakage utility pipe must be encased. This encasing must extend 25 ft beyond 'back of drainage'. This has been interpreted in this case as equal to 25ft beyond the HST ROW on the West. This may need to extend beyond UPRR ROW to the east. This requirement is interpreted as meaning that the structural

	component of the utility crossing must be the carrier pipe and the casing is therefore non-structural (See also 5.4.4.1.1 below). • Section 5.4.3.2 requires that emergency shut-off valves are provided at each side of the ROW • Section 5.4.4.1.1 requires that the casing pipe shall be assumed to provide no structural support to the carrier pipe, which has been interpreted to mean that the carrier pipe is the structural element. This may preclude a concrete carrier pipe • Section 5.4.4.2.2 requires that the vertical clearance to the utility casing is 25ft minimum above TOR and that 25ft lateral clearance from CL of track to supports. This translates to a minimum span of 66.5' (min span = 25' +25' + 16.5' = 66.5') • Section 5.4.5 requires inspection & maintenance to be carried out on a 'routine basis' (possibly annually).
RELIABILITY / FUNCTIONALITY	AREMA Utilities Crossing Section 5.4.5 requires the development of an emergency response procedure (incorporating a risk analysis) to be developed for all incidents that might jeopardize the integrity of the pipeline.
THIRD PARTY (Utility, Freight, Caltrans, RR, other)	See Railroad Systems above.
SAFETY AND SECURITY	None identified
DIRECT COST	None identified
OTHER	None identified

Part 4 – Mitigation measures

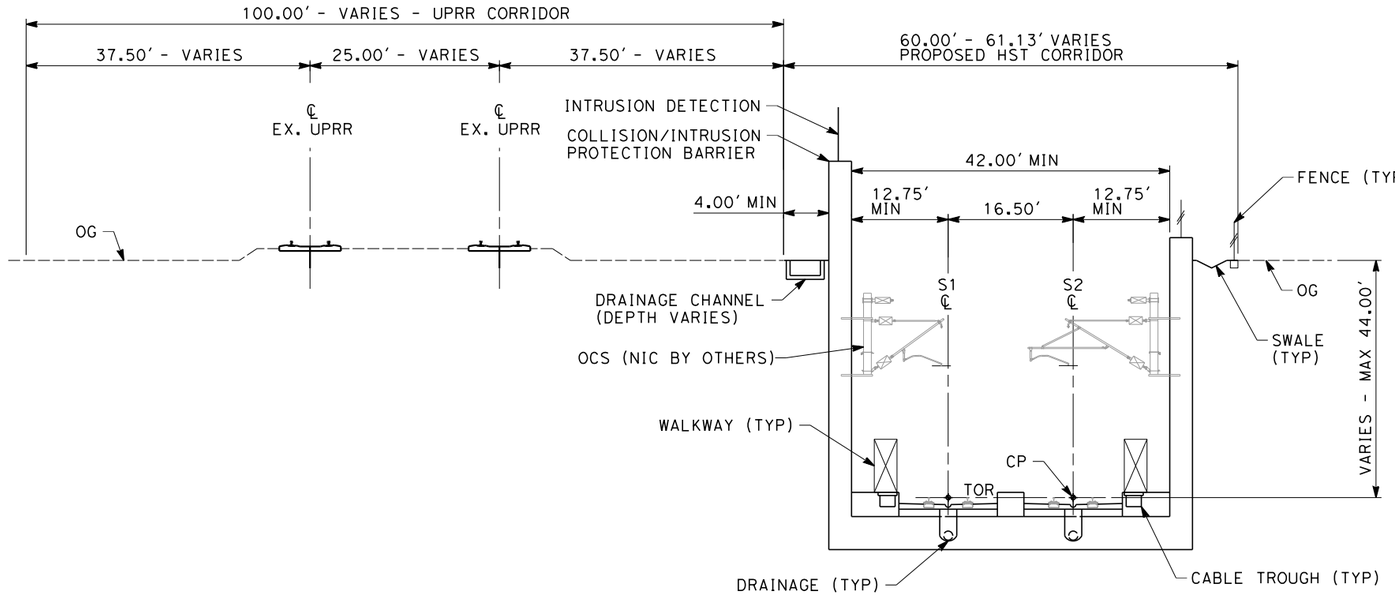
OPERATIONS	The presence of the utility crossing will require HST operations to be planned to accommodate the needs of the utility owners for inspection and maintenance as and when needed.
MAINTENANCE	The design life of the pipe crossings will be required to be the same as the main HST structures.
INFRASTRUCTURE	None identified
RAILROAD SYSTEMS	It is not intended that the catenary support brackets would be fitted to the walls in the section beneath Dry Creek, but they could be in other areas. It may be possible that the catenary can span the entire length of the covered section in which case the catenary support brackets can be located outside the covered area entirely.

Part 5 – List of Supporting Documentation to Design Variance Request

ANALYSIS	N/A

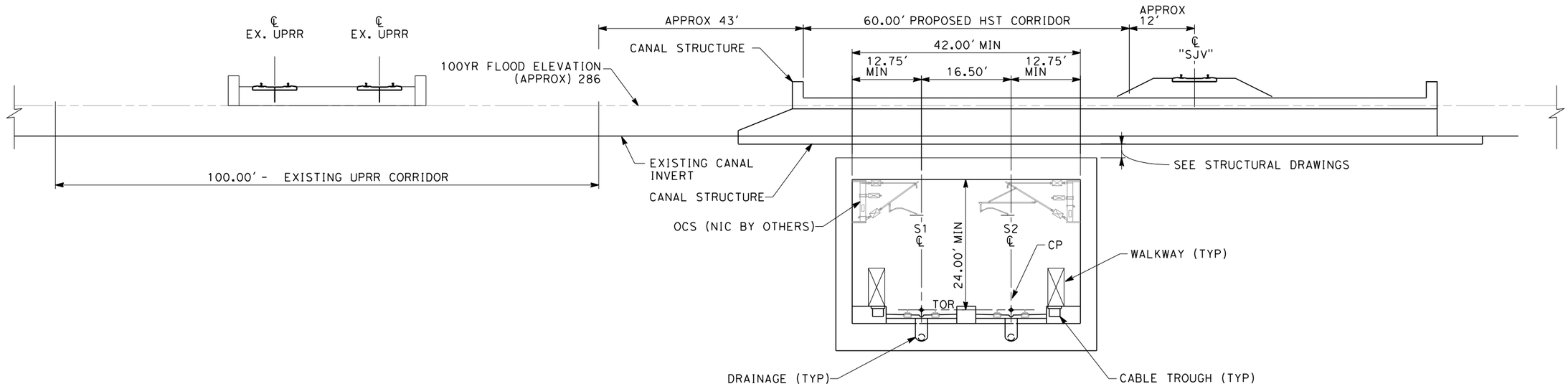
PUBLICATION/STANDARD EXTRACTS	TM 2.1.2 Rev 0 – Alignment Standards for High-Speed Train Operations TM 3.2.1 Rev 1 – OCS Requirements AREMA Standard for Overhead Utility Crossings
RISK ASSESSMENT	N/A
DRAWINGS	Cross-section drawing, TT-D3007 Sketch 1 – Alternative Negative Feeder Location, Sketch 2 – OCS Support Location in 27' Height Clearance Area Sketch 3 – OCS Profile Composite Utility Plan, UT-C4043 Minutes of Meeting
CALCULATIONS	N/A
EXPERT TESTIMONIALS	N/A
CORRESPONDENCE	N/A
OTHER	N/A

Appendix A – Drawings



SECTION 13

"S" 10902+50 THROUGH 10936+95
"S" 10939+55 THROUGH 10951+00
ADJACENT TO UPRR



SECTION 14

"S" 10934+05
TWIN TRACK IN GRADE SEPARATION UNDER CANAL

10 0 10 20
1"=10'
SCALE APPLICABLE FOR FULL SIZE ONLY

NOTES:

1. TRACKFORM SHOWN FOR INFORMATION ONLY (NIC BY OTHERS).
2. SUPERELEVATION IS NOT SHOWN. THE AMOUNT OF APPLIED SUPERELEVATION IS SHOWN IN THE CURVE DATA TABLES.
3. FOR STRUCTURAL DIMENSIONS SEE STRUCTURAL TYPICAL SECTIONS.
4. COLLISION/INTRUSION PROTECTION BARRIER REQUIRED FROM STA 10806+00 - 10950+30 AND STA 10990+70 - 11030+00

REV	DATE	BY	CHK	APP	DESCRIPTION

DESIGNED BY K. SEYMOUR
DRAWN BY P. TONKIN
CHECKED BY D. HUNT
IN CHARGE R. COFFIN
DATE 12/08/11

PROPOSED PRELIMINARY DESIGN

NOT FOR CONSTRUCTION

URS | HMM | ARUP
CALIFORNIA HIGH-SPEED TRAIN

CALIFORNIA HIGH-SPEED RAIL AUTHORITY

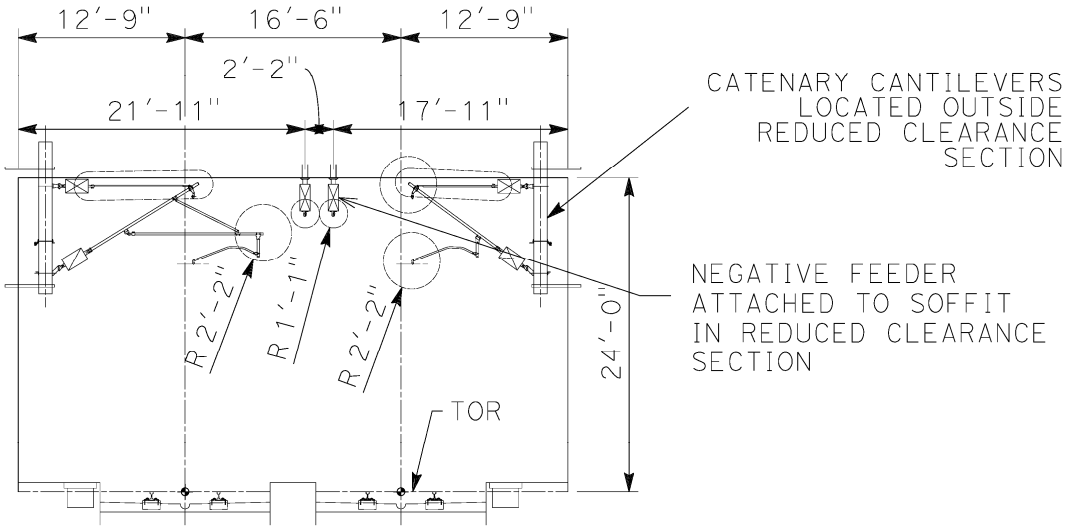
CALIFORNIA HIGH-SPEED TRAIN PROJECT
SIERRA SUBDIVISION
PACKAGE 1A
TRACK GUIDEWAY
TYPICAL SECTIONS

CONTRACT NO.
DRAWING NO. TT-D3007
SCALE AS SHOWN
SHEET NO.

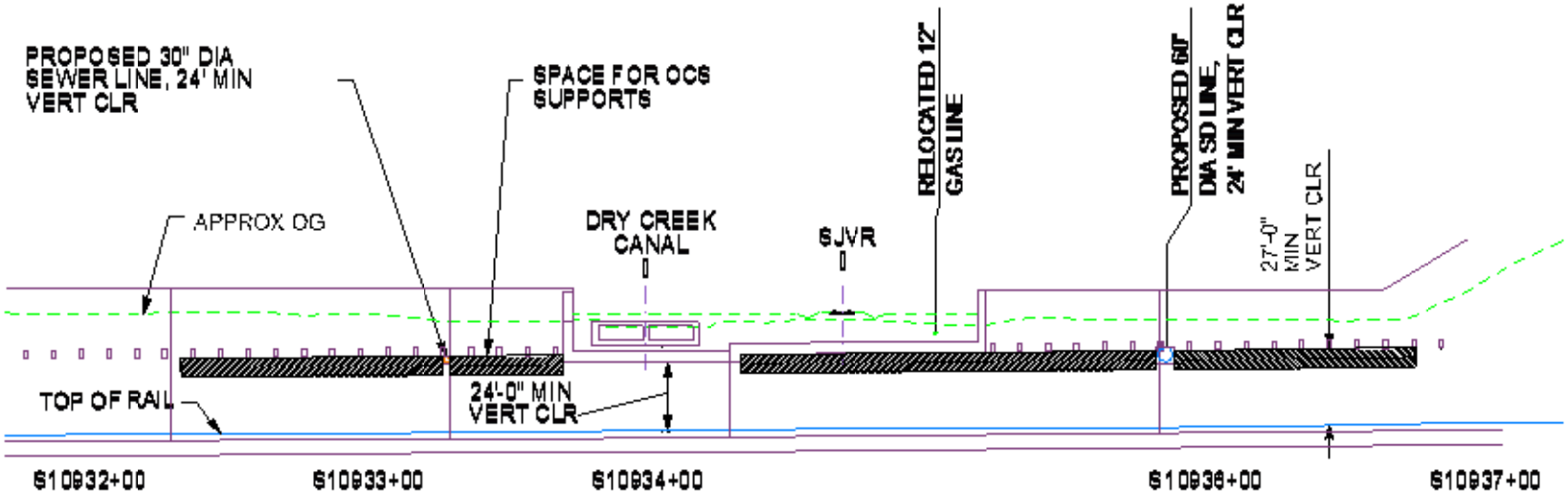
HSR 13-06 - EXECUTION VERSION

Sketch 1

Revised Negative Feeder Location

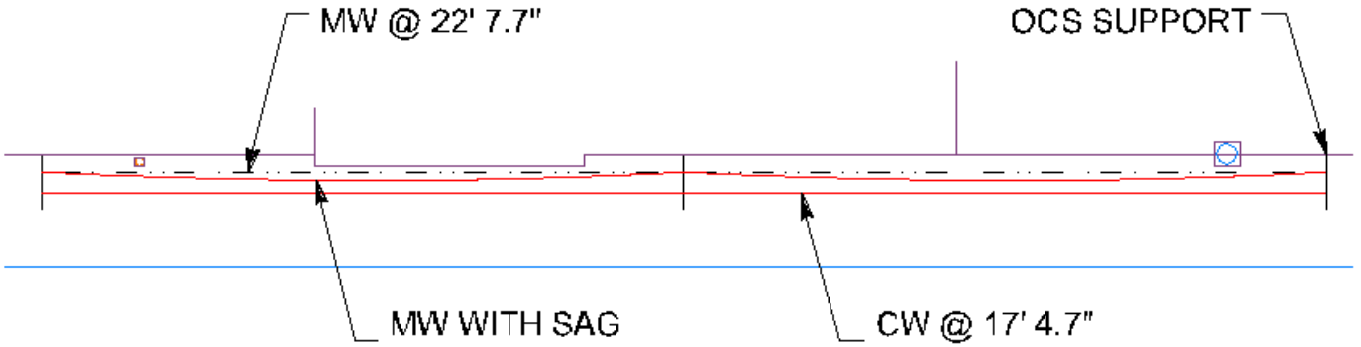


Note: Circles represent 13” required clearance to negative feeder and 26” clearance to catenary metalwork.



OCS SUPPORT LOCATION IN 27' HEIGHT CLEARANCE AREA

NO SCALE

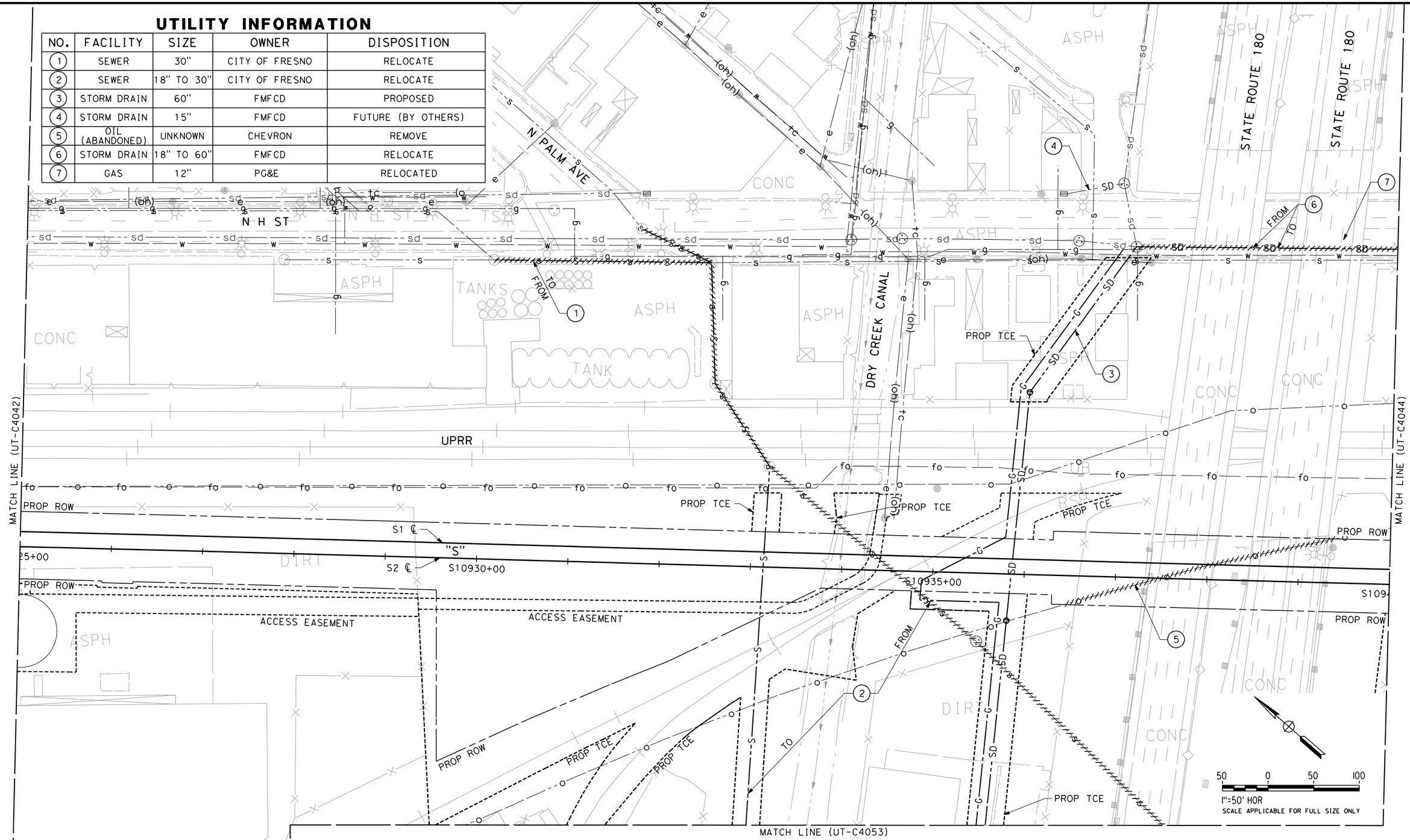


OCS PROFILE (Typical, hangers not shown))

NO SCALE

UTILITY INFORMATION

NO.	FACILITY	SIZE	OWNER	DISPOSITION
1	SEWER	30"	CITY OF FRESNO	RELOCATE
2	SEWER	18" TO 30"	CITY OF FRESNO	RELOCATE
3	STORM DRAIN	60"	FMFCD	PROPOSED
4	STORM DRAIN	15"	FMFCD	FUTURE (BY OTHERS)
5	OIL (ABANDONED)	UNKNOWN	CHEVRON	REMOVE
6	STORM DRAIN	18" TO 60"	FMFCD	RELOCATE
7	GAS	12"	PG&E	RELOCATED



HSR 13-06 - EXECUTION VERSION

REV	DATE	BY	CHK	APP	DESCRIPTION

DESIGNED BY C. ALLEN
DRAWN BY C. DOEHNE
CHECKED BY M. POLISCHUK
IN CHARGE J. LABANOWSKI
DATE 12/08/11

PROPOSED PRELIMINARY DESIGN

NOT FOR CONSTRUCTION

URS | HMM | ARUP
CALIFORNIA HIGH-SPEED TRAIN

CALIFORNIA
HIGH-SPEED RAIL AUTHORITY

CALIFORNIA HIGH-SPEED TRAIN PROJECT
SIERRA SUBDIVISION
PACKAGE 1A
UTILITIES
COMPOSITE UTILITY PLAN
STA. 10925+00 TO STA. 10940+00

CONTRACT NO.
DRAWING NO. UT-C4043
SCALE AS SHOWN
SHEET NO.

mark_polischuk 2/8/2011 10:59:25 AM CAHSRP-r1.tbl CHSR_PDF_half_black.plt P:\27560808\03-RPLANS\MASTERS\30% Procurement\Sheet Files\Package #1\UTC\FB-UT-C4043-PK1A.dgn

Fresno Metropolitan Flood Control District
August 15, 2011
Meeting Notes

HST Section: Fresno to Bakersfield

Meeting Date: August 15, 2011

Location: FMFCD Office, 5469 E Olive Ave, Fresno, CA 93727

Purpose: Coordination

Participants: Jerry Lakeman, 559-456-3292, FMFCD
Mark Will, 559-456-3292
Alan Hofmann, 559-456-3292
David Pomaville, 559-456-3292
Melisa Bittancourt, 916-567-2568, PB
Johnny Kuo, 415-243-4683
Scott Lanphier, 916-915-2700
Garry Horton, By Phone, 916-784-3900, URS
James Labanowski, 916-784-3900
Carlton Allen, 916-784-3900
Stephen Burges, 415-957-9445, ARUP
Grant Schlereth, 415-946-0246
Robert Henderson, By Phone, 714-435-6143, CH2M Hill

Prepared by: Carlton Allen

Action Items:

- Scott will coordinate with Alan on agreement
- FMFCD to provide soil data
- FMFCD to provide existing drainage flows and data

Discussion of Issues:

- James gave the introduction/background of design development process
- FMFCD prepared a solution as well for discussion.
    - The pipe would cross under the trench in its existing horizontal location and outlet into the basin. The outlet of the pipe would be lower than the existing floor.
    - A concrete trench/spillway would convey the water into the basin. The spillway would have to be wide enough for maintenance to occur (using a Bobcat to clear silt).
    - Proposed to expand the basin north under the Belmont OH.
- James then led the discussion on the five alternatives proposed in the memo
    - Alternative 1 (Gravity Under HST, Deepen Basin)
        - Similar to FMFCD's proposal
        - Increased maintenance compared to existing

Fresno Metropolitan Flood Control District
August 15, 2011
Meeting Notes

  - Alternative 2 (Pumped Over HST)
    - Pump station on east side of UPRR is an issue
    - FMFCD would prefer to dismiss this alternative based on the need to maintain more pumps
  - Alternative 3 (Gravity Under HST, Reroute System)
    - Additional headloss from extended length of pipe a concern for FMFCD
  - Alternative 4 (Sag Culvert Under HST)
    - FMFCD prefers their spillway idea for ease of maintenance
  - Alternative 5 (Gravity Over HST Without Pump)
    - FMFCD agreed that is not a feasible solution
  - FMFCD considered Alternatives 1 and 3, along with their solution as the feasible options
- Surface Drainage
  - FMFCD, FID, and City of Fresno must approve discharges to Dry Creek.
  - Pumping directly to Dry Creek was not considered favorable.
  - Flow from HST system must be attenuated to pre improvement rate before it enters the FMFCD system.
    - FMFCD will provide Q they will accept into their system
- The Belmont underpass has not flooded since the 96" storm drain was built (2001).
- FMFCD is also concerned about road improvements and where flows will go.
- FMFCD would review design at no expense.
- FMFCD would like to be paid for work associated with the relocation of existing facilities.
- FMFCD would assess the Authority a drainage fee
- Who will maintain new basins that are constructed by the HSTP?
- Jerry said that FMFCD has approx. 1.5 million CY of material east of town in basin sites that can be excavated.
- FMFCD has soil samples for most basin sites.
- There are also several basins to the south and west of town that have available material to be excavated.
- One location has higher than background lead levels
  - Would provide this material at no cost
- FMFCD would like to tell contractors they have available fill, how can they do this?
  - How will they know who is bidding on the project?
    - PMT discussed the Industry Forum happening on September 8th.
- FMFCD could not find description in EIR of borrow material.
- Basin EH – meeting with between MF team and FMFCD to follow
- HSTP schedule was discussed.

URS/HMM/Arup Joint Venture

California High-Speed Train Project
Fresno - Bakersfield

City of Fresno
October 21, 2011
Meeting Notes

HST Section: Fresno to Bakersfield

Meeting Date: October 21, 2011

Location: City Hall, 2600 Fresno Ave, Fresno, CA

Purpose: Utility Coordination

Participants: Scott Mozier, 559-621-8811, City of Fresno
Doug Hecker, 559-621-8554
Robert Anderson, 559-621-8610
James Labanowski, 916-784-3900, URS
Mark Polischuk, 916-784-3900
Johnny Kuo, 415-243-4683, PB

Prepared by: Mark Polischuk

Action Items:

- URS to prepare a large strip map of proposed utility work for the City of Fresno.
- City will double check the manholes inverts along the sewer line in question near the Dry Creek Canal.
- URS to check benchmarks of topo survey done to compare to City of Fresno information that may identify where the differential between elevations is coming from.
- URS to check in with structures to identify whether adjustments could be made to allow for the sewer line.
- URS to check and confirm the sewer lines at Church Ave including two private lines.

Discussion of Issues:

- James gave the introduction/background of utility development process. Emphasized that we would like to focus on the sewer line that is in conflict with the trench structure near Dry Creek Canal.
    - City wanted to know if the structure could be adjusted to allow the sewer line to pass by without conflict.
    - City also suggested that we could look at the existing sewer line facility in greater detail and see what sort of impact would occur if we were to chase the elevation differential needed back through the system to make up the difference. Also included pipe replacement and possibly size in the analysis.
    - City suggested looking at placing a siphon in the canal at the point of conflict to avoid the sewer line.
    - City was highly opposed to a lift station and would like to avoid it at all costs.
- It was noted that all water lines need two points of service for each parcel. A consideration for all water line proposals.

California High-Speed Train Project

DESIGN VARIANCE COVER SHEET

Design Variance Request Number: URS-INF-3-0005

Design Variance Request Title:

Horizontal Curve at SR-99

Prepared by:

URS/HMM/Arup a Joint Venture Company	Jun 06, 2012
Regional Consultant	Date

PMT Review:

Richard Schmedes	Aug 25, 2012
Systems	Date
John Chirco	Sep 18, 2012
Infrastructure	Date
Joseph Metzler	Aug 10, 2012
Operations/Maintenance/Safety	Date
Frank Banko	Jun 13, 2012
Rolling Stock	Date
Oliver Hoehne	Aug 14, 2012
System Integration	Date

PMT Recommended:

Thomas Tracy	Sep 06, 2012
PMT Regional Manager	Date

PMT Approval:

Ken Jong	Sep 11, 2012
Engineering Manager	Date

Agency Concurrence:

CHSR Authority Chief Engineer	Date

CHST DESIGN VARIANCE REQUEST FORM

Part 1 – Design Variance Request Information

Title/Subject: Horizontal Curve at SR-99

Number: **URS-INF-3-0005** **Revision:** **3**

Contract Name & Number (Final Design): HSR 06-0003

Region: Fresno - Bakersfield

Location: Fresno

Regional Consultant's / Third Party Design Drawing Reference: TT-D101 TO TT-D1024

Date Submitted to RMT & PMT

PREPARED / SUBMITTED BY: NAME: Richard Coffin COMPANY: URS/HMM/Arup A Joint Venture Company SIGNATURE: DATE: 31/08/12	REGISTERED PROFESSIONAL ENGINEER RICHARD STUART COFFIN C51265 EXP 9-30-13 CIVIL ENGINEERING STATE OF CALIFORNIA (Engineering Seal)

**Note design variance numbers will follow the same convention:* "ABC" will abbreviate the name of the firm submitting the variance, "DEF" abbreviates the name of firm receiving the variance request, "X" is the revision number starting from 0, and the last four numbers count the number of total submittals staring from one.

Part 2 – Design Variance Request Information

CHSTP DESIGN REQUIREMENT Include reference to drawings, design criteria, technical memos, specifications	TM 2.1.2 Rev 0 – Alignment Design Standards for High-Speed Train Operations
DESIGN CRITERIA REQUIRING A VARIANCE	The design speed of curve No. 105 (STA 11124+74 to 11252+15) is reduced from 250mph to 220mph. The maximum operating speed of 220mph will not be affected; however, future operating speeds of up to 250mph will be precluded. The curve radius along the centerline of the southbound track (inside of the curve) is 21,288.5 ft. The curve radius is within exceptional criteria at 220mph as defined in Section 6.1.2. The applied superelevation of 6.75in is within exceptional criteria and unbalanced superelevation of 2.34in is within maximum criteria as defined in Section 6.1.3. The vertical curve overlap with horizontal spiral is an exceptional condition as defined in Section 6.1.7.
REASON FOR REQUESTING A VARIANCE	In south Fresno, the high-speed train (HST) alignment diverges from an alignment parallel to the Union Pacific Railroad (UPRR) to parallel the BNSF Railway alignment. These two tangents are connected with a long horizontal curve. To minimize the impact on the City of Fresno the curve should be as short as practical. As part of the 15% design cost containment measures, an alignment was developed to be generally at grade through Fresno. This design required a reduction in the curve radius to reduce the impact on the city of the HST corridor. Key constraints were avoided by reducing the curve radius, including Jensen Bypass bridge, two distribution warehouses, and Cedar Avenue bridge. With PMT consultation it was agreed that a 220mph alignment should be adopted in the 15% design. The outcome of the cost containment exercise provided the basis for the assumption that the alignment should be below grade and pass through a flood plain. Minimizing the impact to the E Jensen Bypass bridge was a key consideration for the PMT during the cost containment phase. To pass beneath the existing bridge the HST alignment depresses

	approx 7ft below grade. An at-grade HST alignment would require reconstruction of the E Jensen Bypass bridge and junction remodeling at the intersection with Golden State Blvd (GSB). Between Jensen Bypass and GSB the vertical alignment would pass underneath the existing bridge at E Jensen Bypass and rise to be on a structure over GSB. The vertical curve required for this change in elevation would overlap with a horizontal spiral. Both horizontal and vertical geometry is constrained by the existing structure at Jensen Bypass.
JUSTIFICATION FOR VARIANCE	The current proposed design is within the defined environmental footprint and has minimal impact to the existing infrastructure in South Fresno. The proposed design is indicated by a red line in Appendix A, and is within exceptional alignment criteria at 220mph. Achieving an alignment that meets 250mph minimum design criteria or 220mph minimum design criteria would increase the impacts on the City of Fresno Options for a 250mph minimum radius curve and a 220mph minimum radius curve are shown in Appendix A in blue and green respectively. Significant differences to the proposed alignment are detailed below. **Impacts of the 250mph minimum radius curve (blue line):** Achieving a 250mph alignment that meets the minimum criteria would have a significant impact to the City of Fresno. Two large distribution centers between GSB and Golden State Highway would need to be removed, which would be a significant cost to the project. A comparative cost analysis of the three alignment alternatives is included in support of this design variance (See Appendix B). The E Jensen Bypass bridge and the intersection with GSB would need to be reconstructed, since the City of Fresno requires E Jensen Bypass to be reconnected with GSB. Provision of an interchange to maintain this connection would require significant junction realignment, increase traffic disruption during construction, and increase the cost. The skew angle of the crossing over GSB would be increased. The length of the skewed crossing would be approximately twice as long as the

	proposed alignment and would increase the cost of the project. **Impacts of the 220mph minimum radius curve (green line):** A 220mph minimum radius curve would constrain the viaduct column locations in the vicinity of South Cedar Ave/State Route 99 (SR99). As shown in Appendix A the HST alignment would cross South Cedar Ave in the same location as an existing bridge crossing over SR99. At STA 11195+00 placement of a column support is constrained by the existing South Cedar Ave bridge and the SR99 roadway. The green line would move the HST alignment to the point where South Cedar Ave and SR99 cross so that there would be no opportunity to locate a column support. The structure options then would be to demolish and relocate the SR99 junction structure or to provide a clear span structure to carry the HST. This structure would have an 800ft span and would have an increased visual impact compared to the red line as it is at the highest point of the alignment within Fresno.
PROPOSED ALTERNATIVE DESIGN REQUIREMENT	The proposed 220mph exceptional red line alignment represents a balance between achieving the 220mph minimum criteria (green line) and the site constraints. The red line alignment mitigates a number of constraints in the 220mph minimum radius green alignment with a 712ft reduction in radius. This small radius change decreases the complexity of the HST structure crossing of South Cedar Ave and SR99. The location of columns for these structures is highly constrained by the existing structure and roadways. **Summary of options:**

Option	Speed (mph)	Radius (ft)	Ea / Eu (in)
Blue	250	28,000	6.25 / 2.68
Green	220	22,000	6.25 / 2.55
Red	220	21,288.5	6.75 / 2.34

	Note: The unbalanced superelevation is decreased to compensate for the superimposition of the vertical crest curve and superelevation as detailed in Section 6.1.7 (TM 2.1.2). **Overlap of vertical curve and horizontal spiral:** The location of the vertical curve is constrained by the requirement to pass under the existing structure at Jensen Bypass and over the existing GSB roadway. The overlap between the elements is approximately 920ft. Widening the radius to shift the spiral outside of the vertical curve is constrained as outlined previously.

Part 3 – Impact Analysis

OPERATIONS	PMT operations team should analyze the effects of the applied superelevation on the curve on a train accelerating out of the station. The 220mph alignment precludes the ability to increase operating speeds up to 250mph in the future.
MAINTENANCE	The reduced radius and increased applied superelevation may increase the maintenance requirements through increased rail wear.
INFRASTRUCTURE	Due to the proposed 6.75in of applied superelevation (Ea), passenger comfort may be reduced when travelling below 220mph. To mitigate the impacts to passenger comfort, the vertical curve radius has been increased to meet the desirable criteria. The radius of the proposed alignment is 21,288.5ft. This represents a 712ft reduction to the minimum criteria.
RAILROAD SYSTEMS	None identified
RELIABILITY / FUNCTIONALITY	None identified
THIRD PARTY (Utility, Freight, Caltrans, RR, other)	The proposed design would minimize disruption during construction to the City of Fresno by not requiring reconstruction of E Jensen Bypass bridge. Disruption to the City of Fresno and Caltrans would be reduced by not requiring reconstruction of South Cedar Ave bridge over SR99.
SAFETY AND SECURITY	The proposed design is within acceptable range for exceptional radii in the design standards. Therefore the design would not pose a safety risk above those accepted in the design standards.

DIRECT COST	The proposed scheme (red line) is in the 15% design and would not constitute a change in the 15% design cost estimate. The 250mph (blue line) option would require reconstructing the E Jenson Bypass/GSB interchange and removal of two distribution centers. The overall cost has not been assessed but these additional items would increase the cost compared to the 15% design. The 220mph minimum (green) alignment structure options would be to demolish and relocate the SR99 junction structure or to provide a clear span structure to carry the HST. The cost has not been assessed but reconstruction of South Cedar Ave bridge would increase the project cost compared to the 15% design. An 800ft clear span over South Cedar Ave and SR99 would increase the quantity of complex structure compared to the 15% design. The complexity of construction of the longer span would also increase.
OTHER	None identified

Part 4 – Mitigation measures

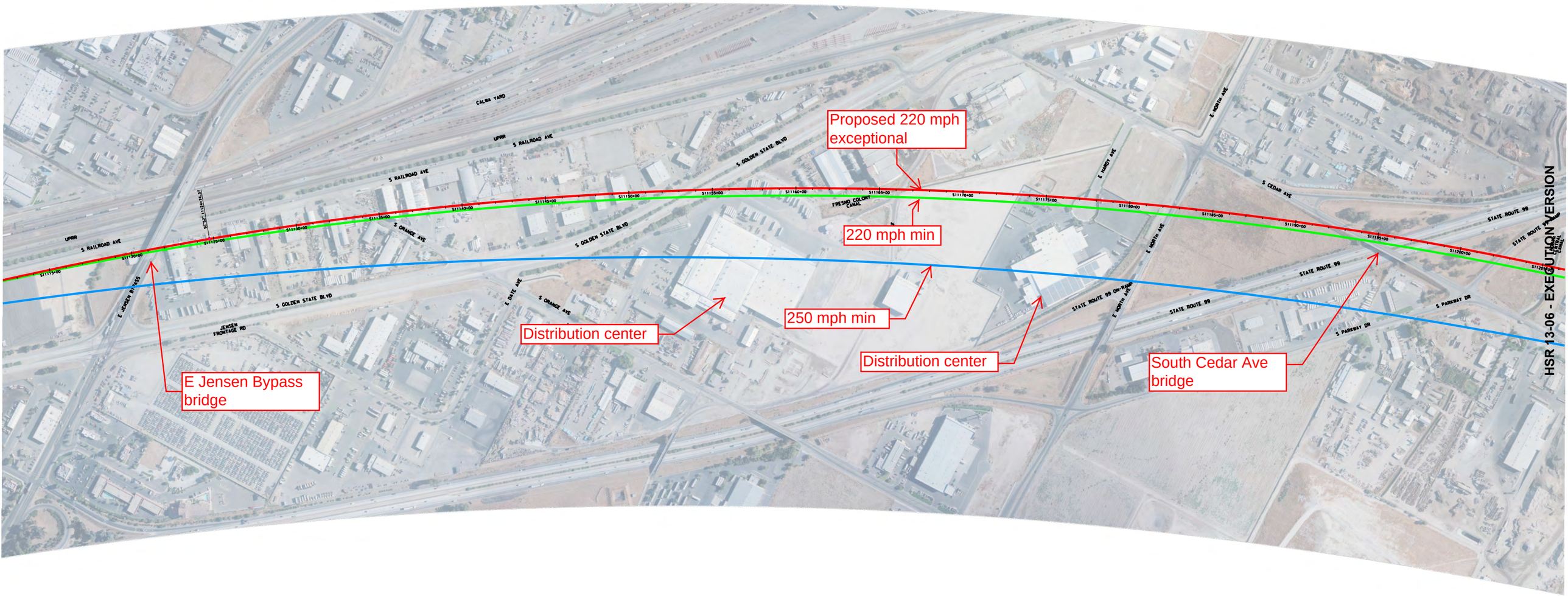
OPERATIONS	The PMT operations team should perform an analysis to determine operational issues and develop further mitigation measures as required.
MAINTENANCE	The curve radius and superelevation are not the absolute exceptional values. They have been maximized within the site constraints to minimize the maintenance requirements. Increased inspection may mitigate maintenance issues.
INFRASTRUCTURE	The radius of the curve is 21,288.5ft which is not the absolute exceptional minimum value. It has been maximized within the site constraints to improve operations and maintenance of the infrastructure. Neither the Ea nor Eu would be at the absolute exception maximum values. Ea and Eu would be 6.75in and 2.34in, respectively. The vertical curve length has been increased by 250ft to exceed the desirable criteria. As stated in Section 6.1.7, crest curves reduce the gravitational effect. The vertical curve length has been designed to minimize these effects.

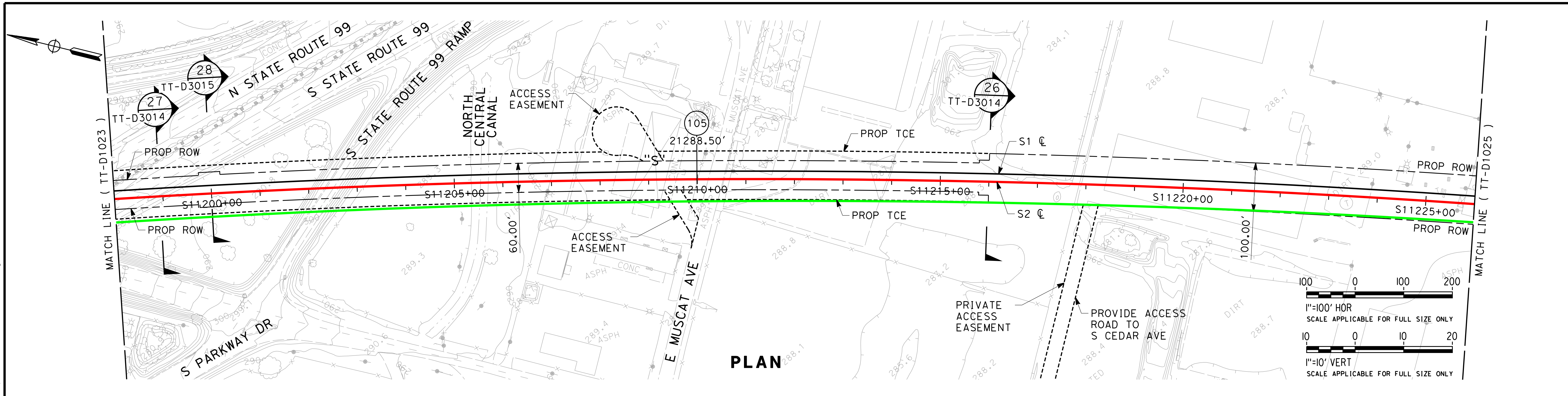
RAILROAD SYSTEMS	None identified

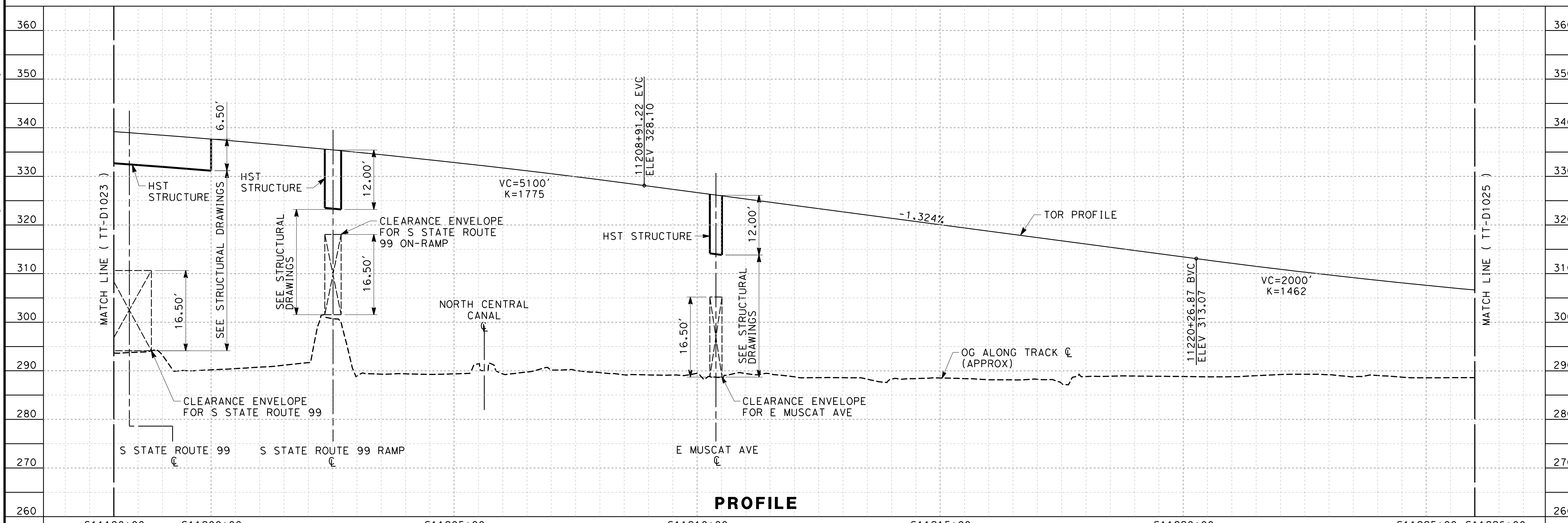
Part 5 – List of Supporting Documentation to Design Variance Request

ANALYSIS	N/A
PUBLICATION/STANDARD EXTRACTS	TM 2.1.2 Rev 0 – Alignment Design Standards for High-Speed Train Operations
RISK ASSESSMENT	N/A
DRAWINGS	Alignment plan and profile drawings TT-D1021 through TT-D1024 dated 06/06/12 supplemented with alternatives (see Appendix A).
CALCULATIONS	Comparative Cost Analysis of Alignment Options (see Appendix B)
EXPERT TESTIMONIALS	N/A
CORRESPONDENCE	N/A
OTHER	N/A

Appendix A – Option Layouts


Proposed 220 mph exceptional
220 mph min
250 mph min
Distribution center
Distribution center
E Jensen Bypass bridge
South Cedar Ave bridge
HSR 13-06 - EXECUTION VERSION





REV	DATE	BY	CHK	APP	DESCRIPTION

DESIGNED BY K. SEYMOUR
DRAWN BY P. TONKIN
CHECKED BY D. HUNT
IN CHARGE R. COFFIN
DATE 06/06/12

PROPOSED PRELIMINARY DESIGN

NOT FOR CONSTRUCTION

URS | HMM | ARUP
CALIFORNIA HIGH-SPEED TRAIN

CALIFORNIA HIGH-SPEED RAIL AUTHORITY

CALIFORNIA HIGH-SPEED TRAIN PROJECT
SIERRA SUBDIVISION
PACKAGE 1C
TRACK GUIDEWAY
PLAN AND PROFILE
STA. 11198+00 TO STA. 11226+00

CONTRACT NO.
DRAWING NO. TT-D1024
SCALE AS SHOWN
SHEET NO.

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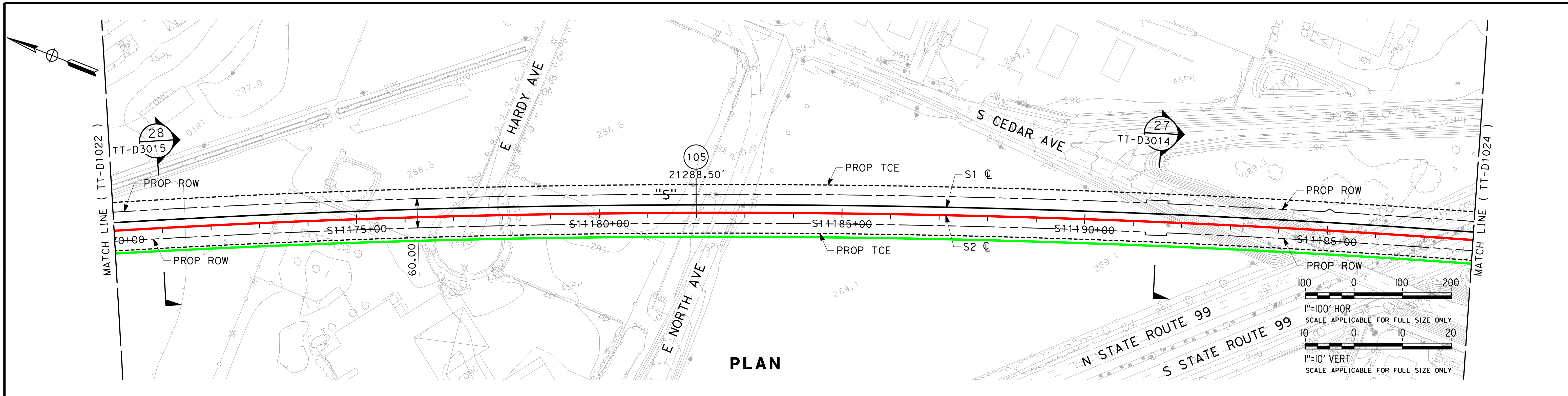
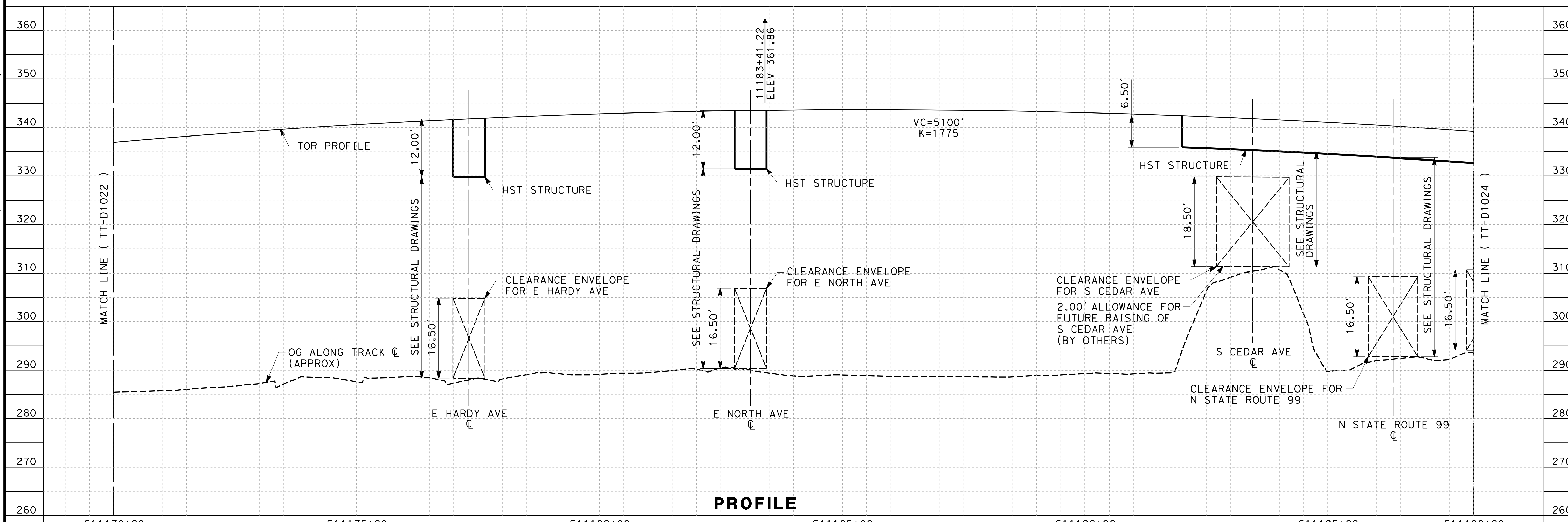




REV	DATE	BY	CHK	APP	DESCRIPTION

DESIGNED BY K. SEYMOUR
DRAWN BY P. TONKIN
CHECKED BY D. HUNT
IN CHARGE R. COFFIN
DATE 06/06/12

PROPOSED PRELIMINARY DESIGN

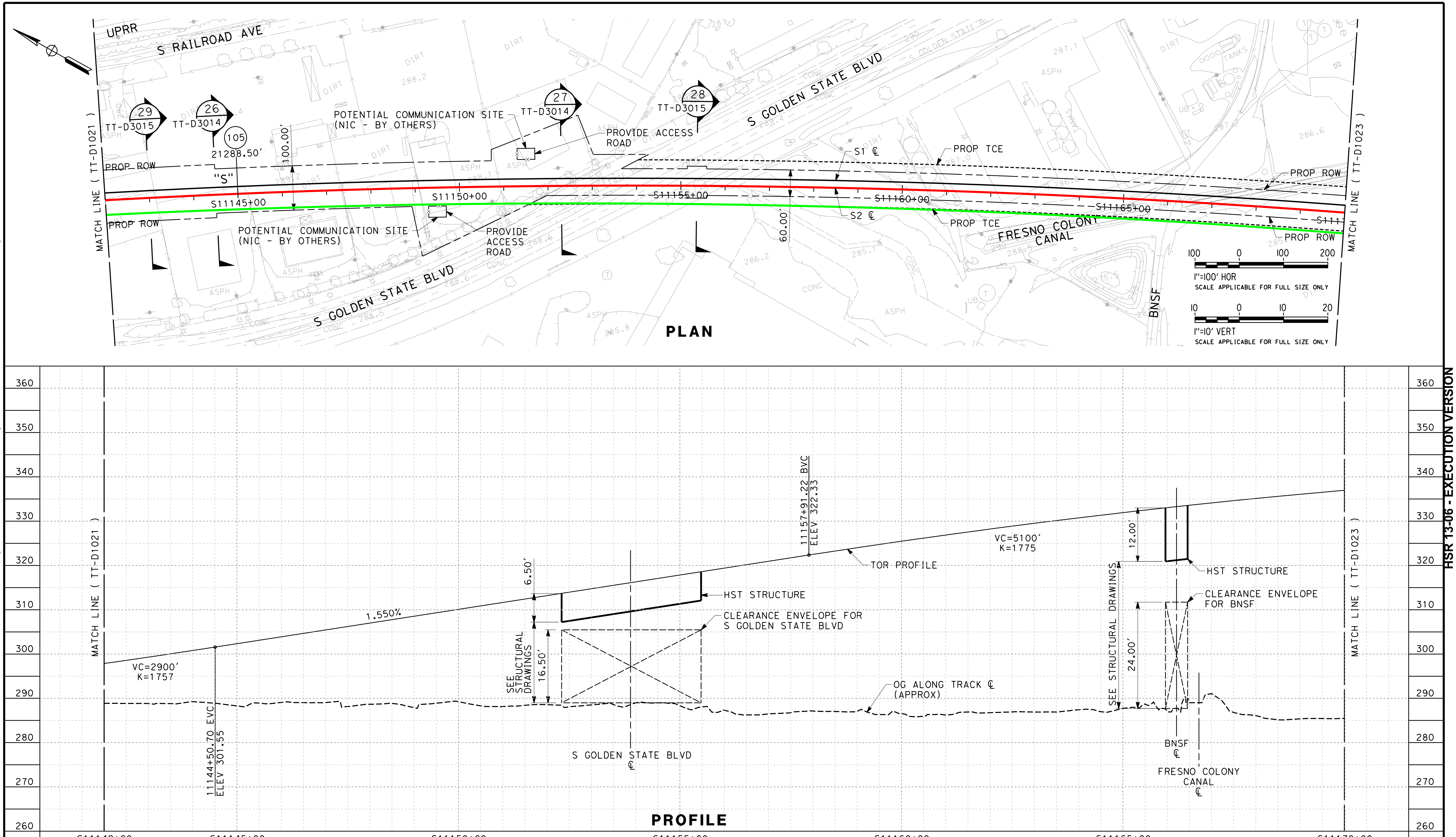
NOT FOR CONSTRUCTION

URS | HMM | ARUP — CALIFORNIA HIGH-SPEED TRAIN

CALIFORNIA HIGH-SPEED RAIL AUTHORITY

CALIFORNIA HIGH-SPEED TRAIN PROJECT
SIERRA SUBDIVISION
PACKAGE 1C
TRACK GUIDEWAY
PLAN AND PROFILE
STA. 11170+00 TO STA. 11198+00

CONTRACT NO.
DRAWING NO. TT-D1023
SCALE AS SHOWN
SHEET NO.



REV	DATE	BY	CHK	APP	DESCRIPTION

DESIGNED BY K. SEYMOUR
DRAWN BY P. TONKIN
CHECKED BY D. HUNT
IN CHARGE R. COFFIN
DATE 06/06/12

PROPOSED PRELIMINARY DESIGN

NOT FOR CONSTRUCTION

URS | HMM | ARUP
CALIFORNIA HIGH-SPEED TRAIN

CALIFORNIA HIGH-SPEED RAIL AUTHORITY

CALIFORNIA HIGH-SPEED TRAIN PROJECT
SIERRA SUBDIVISION
PACKAGE 1C
TRACK GUIDEWAY
PLAN AND PROFILE
STA. 11142+00 TO STA. 11170+00

CONTRACT NO.
DRAWING NO. TT-D1022
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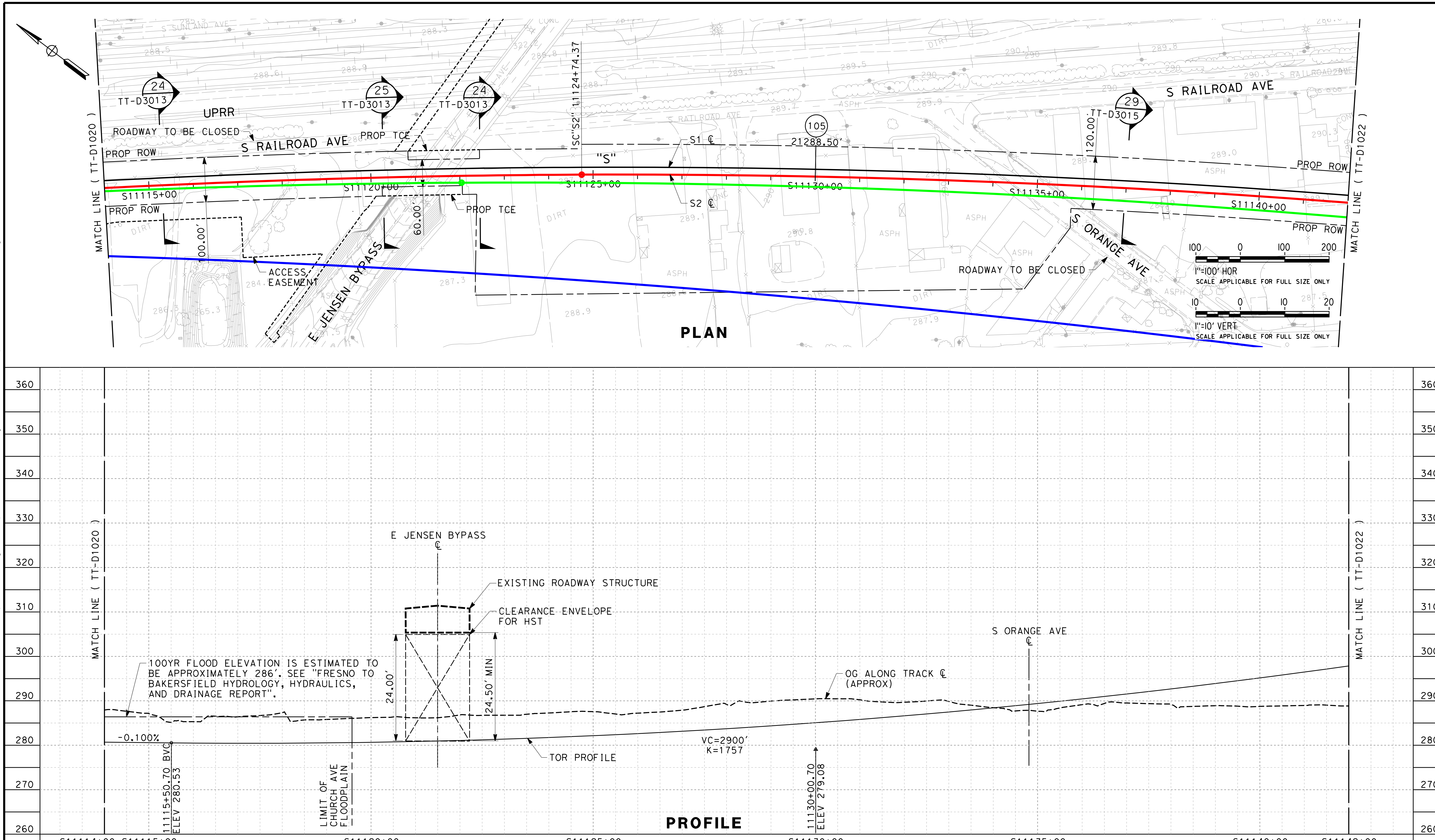
SHEET NO.



HSR 13-06 - EXECUTION VERSION

REV	DATE	BY	CHK	APP	DESCRIPTION

DESIGNED BY	K. SEYMOUR
DRAWN BY	P. TONKIN
CHECKED BY	D. HUNT
IN CHARGE	R. COFFIN
DATE	06/06/12

PROPOSED PRELIMINARY DESIGN

NOT FOR CONSTRUCTION

URS | HMM | ARUP — California High-Speed Train

CALIFORNIA HIGH-SPEED RAIL AUTHORITY

CALIFORNIA HIGH-SPEED TRAIN PROJECT
SIERRA SUBDIVISION
PACKAGE 1C
TRACK GUIDEWAY
PLAN AND PROFILE
STA. 11114+00 TO STA. 11142+00

CONTRACT NO.	
DRAWING NO.	TT-D1021
SCALE	AS SHOWN
SHEET NO.	

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Appendix B – Comparative Cost Analysis of Alignment Options

DV05	Comparative Cost Analysis of Alignment Options	Red Line Quantity	Green Line Quantity	Blue Line Quantity	Unit	Rate	Red Line $	Green Line $	Blue Line $
40.01	**Demolition, clearing, site preparation**								
	APN 487-140-39S			1	LS	$ 11,482,000	$ -	$ -	$ 11,482,000
	APN 487-140-51			1	LS	$ 5,657,000	$ -	$ -	$ 5,657,000
	APN 487-140-52S	1	0.5		LS	$ 4,857,000	$ 4,857,000	$ 2,428,500	$ -
	Subtotal						**$ 4,857,000**	**$ 2,428,500**	**$ 17,139,000**
10.02	**Track structure: Major/Movable bridge**								
10.02.053	Bridge Structure - 2 Track Steel Truss Bridge (355' span) S. Cedar	0.07	0.09	0.07	Route Mile	$ 158,167,680	$ 11,071,738	$ 14,067,338	$ 11,071,738
	Subtotal						**$ 11,071,738**	**$ 14,067,338**	**$ 11,071,738**
	Total Comparative Construction Cost						**$ 15,928,738**	**$ 16,495,838**	**$ 28,210,738**
The unit costs above are 2010 bid costs.									
To the 2010 Bid Costs, Allocated Contingency is added to these costs at +20%		20%					$ 3,185,748	$ 3,299,168	$ 5,642,148
							$ 19,114,485	$ 19,795,005	$ 33,852,885
Professional Services applied to the Bid Costs:									
	80.03 Final Design +6%	6%					$ 1,146,869	$ 1,187,700	$ 2,031,173
	80.04 Project Mgt for Design & Const. +3%	3%					$ 573,435	$ 593,850	$ 1,015,587
	80.05 Const. Admin & Mgt. +4%	4%					$ 764,579	$ 791,800	$ 1,354,115
	80.07 Legal & Permits +0.5%	0.5%					$ 95,572	$ 98,975	$ 169,264
		13.5%					$ 2,580,455	$ 2,672,326	$ 4,570,139
							$ 21,694,941	*$ 22,467,331*	*$ 38,423,025*
Unallocated Contingency +5%		5%					$ 1,084,747	$ 1,123,367	$ 1,921,151
							$ 22,779,688	*$ 23,590,697*	*$ 40,344,176*
Escalation from 2010 to 2012 - add 4% escalation.		4%					$ 911,188	$ 943,628	$ 1,613,767
Total Comparative Cost		**0.04**					**$ 23,690,875**	**$ 24,534,325**	**$ 41,957,943**

California High-Speed Train Project

DESIGN VARIANCE COVER SHEET

Design Variance Request Number: URS-INF-2-0010

Design Variance Request Title:

Use of Long Spans in Fresno Viaduct

Prepared by:

URS/HMM/Arup a Joint Venture Company	Jun 06, 2012
Regional Consultant	Date

PMT Review:

Richard Schmedes	Aug 25, 2012
Systems	Date
John Chirco	Aug 21, 2012
Infrastructure	Date
Joseph Metzler	Aug 23, 2012
Operations/Maintenance/Safety	Date
Frank Banko	Aug 21, 2012
Rolling Stock	Date
Oliver Hoehne	Aug 10, 2012
System Integration	Date

PMT Recommended:

Thomas Tracy	Sep 06, 2012
PMT Regional Manager	Date

PMT Approval:

Ken Jong	Sep 11, 2012
Engineering Manager	Date

Agency Concurrence:

CHSR Authority Chief Engineer	Date

CHST DESIGN VARIANCE REQUEST FORM

Part 1 – Design Variance Request Information

Title/Subject: Use of Long Spans in Fresno Viaduct

Number: URS-INF-2-0010 **Revision:** 2

Contract Name & Number (Final Design): HSR 06-0003

Region: Fresno to Bakersfield

Location: Fresno

Regional Consultant's / Third Party Design Drawing Reference:

CP1C Drawing Number: - ST-J1006

Date Submitted to RMT & PMT

PREPARED / SUBMITTED BY: NAME: Richard Coffin COMPANY: URS/HMM/Arup A Joint Venture Company SIGNATURE: DATE: 31/08/2012	REGISTERED PROFESSIONAL ENGINEER RICHARD STUART COFFIN C51255 EXP 9-30-13 CIVIL ENGINEERING STATE OF CALIFORNIA (Engineering Seal)

**Note design variance numbers will follow the same convention:* "ABC" will abbreviate the name of the firm submitting the variance, "DEF" abbreviates the name of firm receiving the variance request, "X" is the revision number starting from 0, and the last four numbers count the number of total submittals staring from one.

Part 2 – Design Variance Request Information

CHSTP DESIGN REQUIREMENT Include reference to drawings, design criteria, technical memos, specifications	Draft TM 2.10.10 Rev 1 – Track Structure Interaction, dated 29 Feb 2012
DESIGN CRITERIA REQUIRING A VARIANCE	Section 6.10.3 of TM 2.10.10 defines the length of the "Thermal Unit" (L_{TU}) for structures and states that the L_{TU} shall not exceed 330 feet.
REASON FOR REQUESTING A VARIANCE	The Fresno Viaduct non-standard span that crosses South Cedar Avenue requires a steel truss structure of 350 foot span in order to provide clearance to anticipated future Caltrans widening of South Cedar Avenue.
JUSTIFICATION FOR VARIANCE	The TM 2.10.10 guidance is based on assumptions regarding the typical viaduct and the likely combinations of structure depth and end rotation. It is not clear whether the TM takes account of the additional lateral restraint that is provided by slab track (which is expected to be used on this structure). Assumptions are also made using the performance of standard track retaining clips, which could be improved upon by using alternative products. At the location of the South Cedar/SR99 crossing the spans required to cross the obstacles also require the use of a truss structure which may not have been allowed for in the assumptions of the TM. As truss structures are stiffer than conventional girders and because the track to bearing height is much less than is required for conventional girders it is believed that the effect on rail stresses will be reduced. As a consequence the limiting structure length will be higher, and it is expected that a 350ft span will satisfy the rail displacement and stress limitations. However, the calculations show that the differences in structure type were not sufficient alone to reduce the stresses to within limits. The use of ZLR clips or equivalent was able to bring the stresses within limits. The following options could be adopted: • providing a secondary articulation system between the deck slab and the truss structure; • Introducing a rail joint within the 350 foot span.

PROPOSED ALTERNATIVE DESIGN REQUIREMENT	It is proposed that Structure Thermal Units longer than 330ft should be allowed subject to confirmation by detailed calculation and verification of rail stresses.

Part 3 – Impact Analysis

OPERATIONS	There will be an operational benefit from having fewer rail joints.
MAINTENANCE	Introducing a rail joint would increase maintenance costs. Using ZLR track clips would involve a minor maintenance cost from the need to maintain stocks of more than one type of track clip. If calculations of rail stresses prove satisfactory there would be no maintenance implications.
INFRASTRUCTURE	None identified
RAILROAD SYSTEMS	None identified
RELIABILITY / FUNCTIONALITY	None identified
THIRD PARTY (Utility, Freight, Caltrans, RR, other)	None identified
SAFETY AND SECURITY	None identified
DIRECT COST	The overall cost has not been assessed.
OTHER	None identified

Part 4 – Mitigation measures

OPERATIONS	None identified
MAINTENANCE	None identified
INFRASTRUCTURE	None identified
RAILROAD SYSTEMS	None identified

Part 5 – List of Supporting Documentation to Design Variance Request

ANALYSIS	Fresno Viaduct Calculations (Engineering Report, not attached) shows that rail stresses are within limits except in one location that is at 104%. This is thought to be because a marginally longer section of ZLR clips would be required than has been modeled for analysis. It is expected that this section can be brought within limits during detailed design development.
PUBLICATION/STANDARD EXTRACTS	N/A
RISK ASSESSMENT	N/A
DRAWINGS	N/A
CALCULATIONS	N/A
EXPERT TESTIMONIALS	N/A
CORRESPONDENCE	N/A
OTHER	Extract from Pandrol presentation showing use of ZLR clips on HSR projects in China and Korea.

PANDROL

TRACK SYSTEMS

© DELACHAUX GROUP

Track – Bridge Interaction

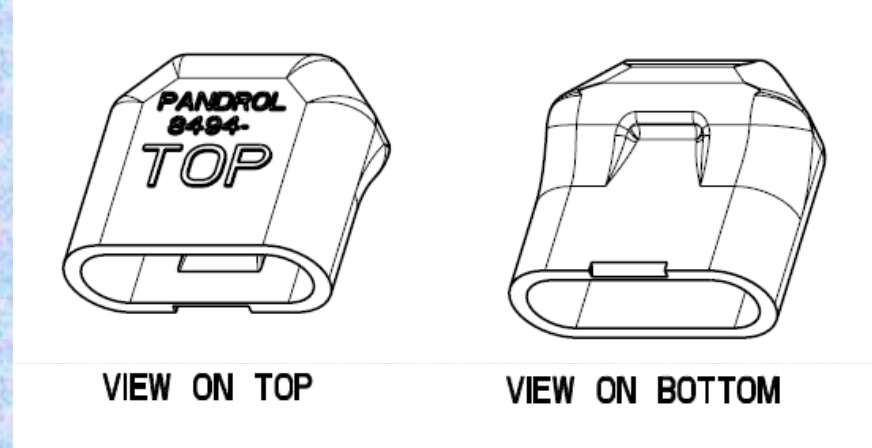
Pandrol Ltd.

EN1991-2:2003 Section 6.5.4

Reduced longitudinal restraint:
(Low toe load FC1101 clips)

Zero longitudinal restraint:
(FC1501 clips with ZLR insulators)

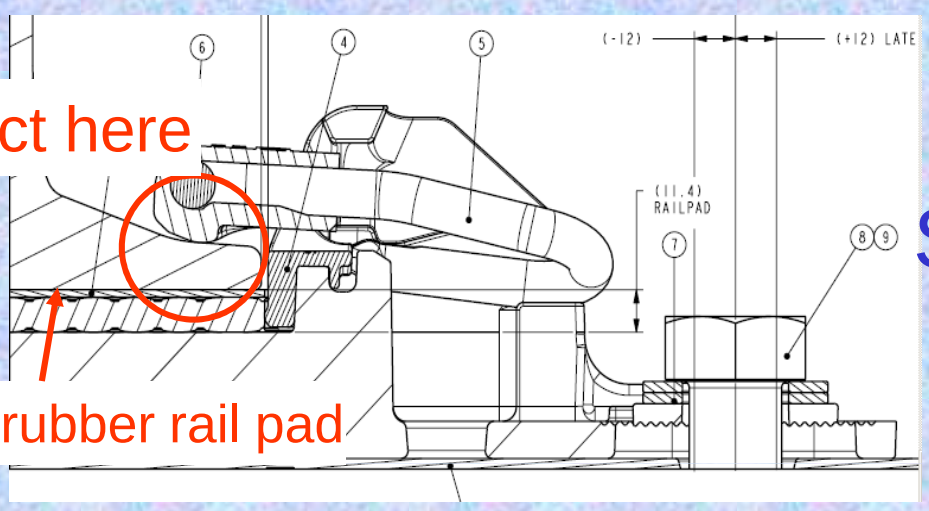
Zero Longitudinal Restraint (PANDROL FASTCLIP)



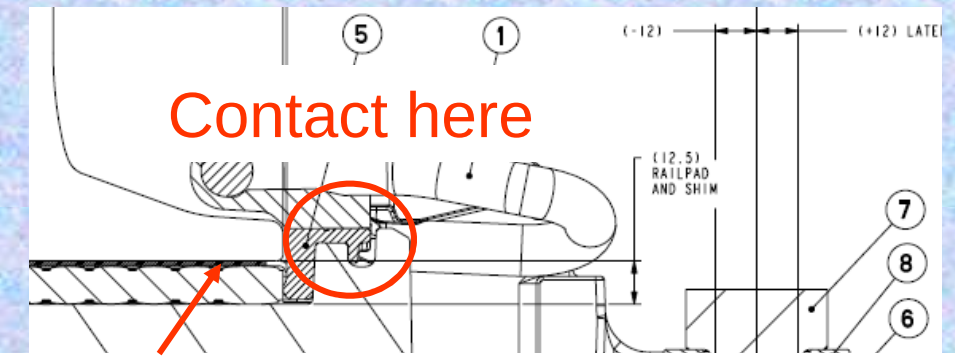
Standard toe insulator

ZLR toe insulator

Zero Longitudinal Restraint (PANDROL FASTCLIP)



Standard assembly



ZLR assembly

Rail on stainless steel slip plate on rubber rail pad

Zero Longitudinal Restraint (PANDROL FASTCLIP)

Zero Longitudinal Restraint (PANDROL e-clip)

Bridge deck ends (DB DS804 Appendix 29):

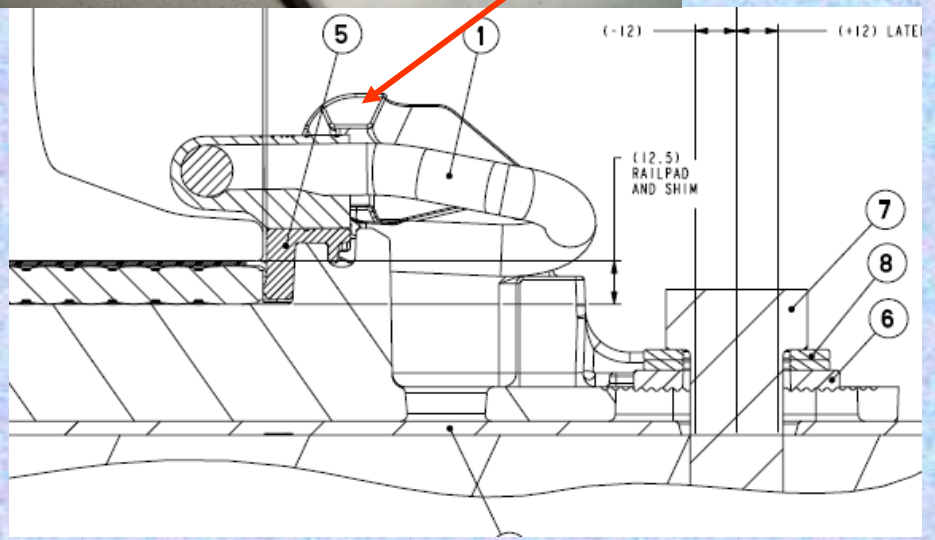
For small amounts of rail uplift, ZLR fastenings can accommodate deck end rotation movements.

ZLR fastenings are designed to have zero compression force in the pad – this does not cause a problem!

For larger amounts of rail uplift the top of the clip touches the lugs on the shoulder. Further movement is resisted.

Bridge deck ends (DB DS804 Appendix 29):

These lugs provide a high resistance to rail uplift if the deck rotation effect is high.



Case study 1

What gets used on HS viaducts?

France

LGV Est

SNCF Viaduct on LGV Est

Ballasted track uses Rail Expansion Joints

Case study 2

What gets used on HS viaducts?

China

Shijiazhuang to Taiyuang

(slab track)

Mixed traffic line (HS at 250kmh/freight at 100kmh)
60% viaduct, 25% tunnel, 15% at grade

FC in use on “C-slab” on viaduct

ZLR is used throughout distinguishable by the blue toe insulators

Case study 4

What gets used on HS viaducts?

Korea Phase 1

Seoul to Chonan, Osong to Daejon

(ballasted track)

KTX Phase 1 uses FastClip ballasted track on viaducts

Mostly short spans, some using ZLR
Longer spans used REJ's

Case study 5

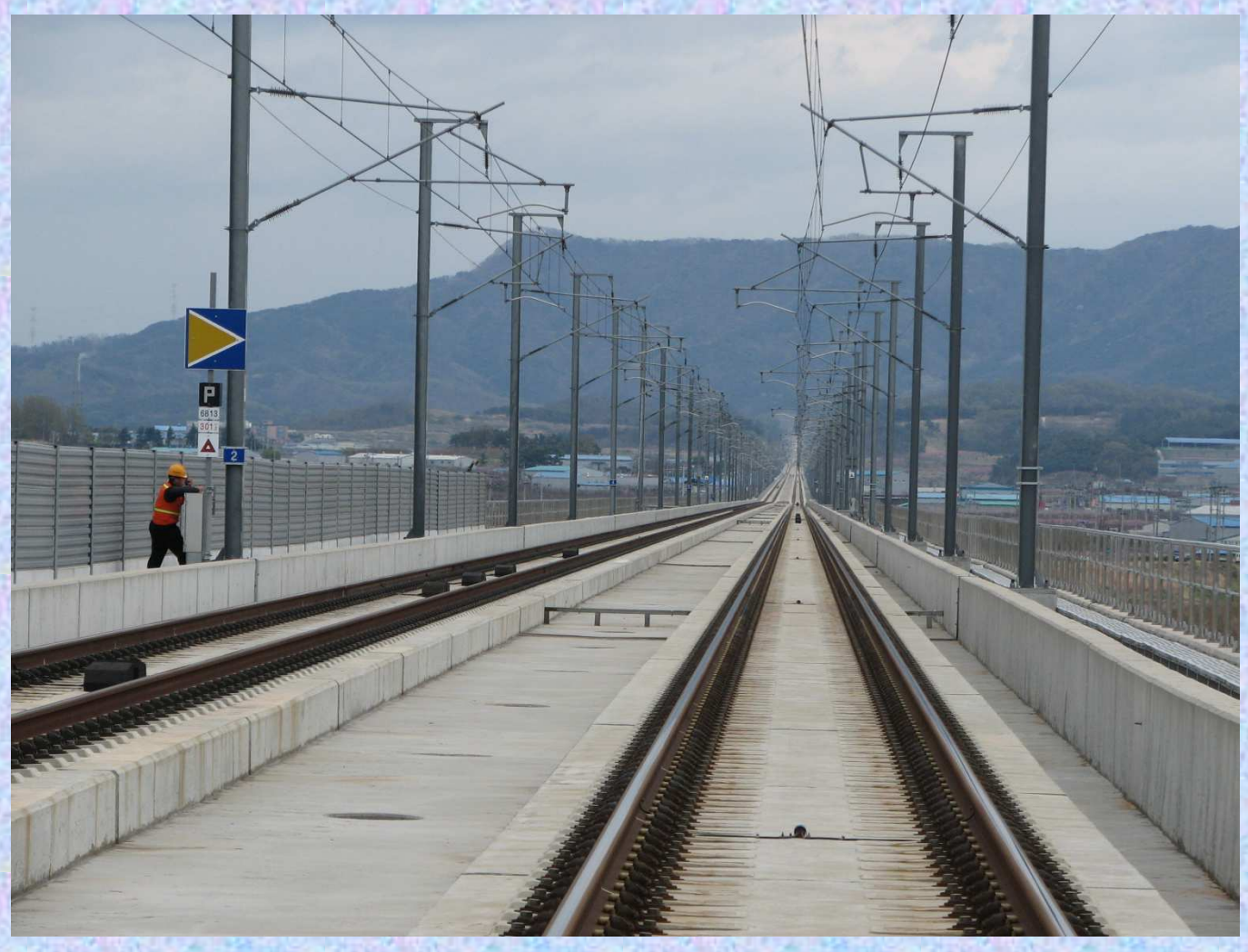
What gets used on HS viaducts?

Korea Phase 2
Daejon to Busan
(slab track)

KTX Phase 2 Fastclip on slab track

Most SMJ's used ZLR fastenings

Only some areas with long decks or close to S+C where REJ's were used



California High-Speed Train Project

DESIGN VARIANCE COVER SHEET

Design Variance Request Number: URS-INF-1-0011

Design Variance Request Title:

Jensen Grade Separation Utility Clearances

Prepared by:	
URS/HMM/Arup a Joint Venture Company	Jun 06, 2012
Regional Consultant	Date
PMT Review:	
Richard Schmedes	Jul 06, 2012
Systems	Date
John Chirco	Sep 21, 2012
Infrastructure	Date
Joseph Metzler	Aug 23, 2012
Operations/Maintenance/Safety	Date
Frank Banko	Jun 13, 2012
Rolling Stock	Date
Oliver Hoehne	Jul 11, 2012
System Integration	Date
PMT Recommended:	
Thomas Tracy	Sep 2012
PMT Regional Manager	Date
PMT Approval:	
Ken Jong	Sep 2012
Engineering Manager	Date
Agency Concurrence:	
CHSR Authority Chief Engineer	Date

HSR 13-06 - EXECUTION VERSION

Part 1 – Design Variance Request Information

Title/Subject: Jensen Grade Separation Utility Clearances

Number: URS-INF-0-0011 Revision: 0

Contract Name & Number (Final Design): HSR 06-0003

Region: Fresno to Bakersfield

Location: Jensen Grade Separation under Jensen Avenue

Regional Consultant's / Third Party Design Drawing Reference:

Date Submitted to RMT & PMT

PREPARED / SUBMITTED BY: NAME: James Labanowski COMPANY: URS/HMM/Arup A Joint Venture Company SIGNATURE: James A. Labanowski Jr. DATE: 06/06/2012	

**Note design variance numbers will follow the same convention:* "ABC" will abbreviate the name of the firm submitting the variance, "DEF" abbreviates the name of firm receiving the variance request, "X" is the revision number starting from 0, and the last four numbers count the number of total submittals staring from one.

Part 2 – Design Variance Request Information

CHSTP DESIGN REQUIREMENT Include reference to drawings, design criteria, technical memos, specifications	TM 2.7.5 Rev 0 – Utility Requirements for 30% Design Level
DESIGN CRITERIA REQUIRING A VARIANCE	TM 2.7.5 Section 6.6.1 – Underground Utilities, states, "At trench sections of the CHSTP, 8 feet or less from the original ground, the utilities shall cross under CHSTP trench sections in casing and top of casing shall be at minimum 8 feet below top of rail. Where the CHSTP trench section is deep, utilities shall cross over the trench section in a utility bridge that spans the entire width of trench section."
REASON FOR REQUESTING A VARIANCE	There are several existing transverse gravity utilities in the area of the Jensen Grade Separation. In these areas the bottom of the trench structure is more than 8 feet from original ground; therefore it is considered deep section of the trench. An 84-inch storm drain and a 30-inch sewer run under Church Avenue. Also a 48-inch sewer runs under the existing Jensen Avenue overhead that will be replaced by twin 36-inch sewer pipes to avoid a direct conflict with the proposed trench structure. These pipes will be protected and will cross under the trench structure where the bottom of the trench structure is more than 8 feet from original ground. Exhibits in Appendix A show the pipes crossing the CHSTP alignment.
JUSTIFICATION FOR VARIANCE	Continuously welded steel pipes will be used to encase the utility pipes as they pass under the HST. The casing would allow for the replacement of the pipes without disturbing the trench. Due to the flat topography of Fresno the pipes of the existing gravity utilities are near the minimum slope standards. An increase in pipe length due to pipe relocation between two fixed points on either side of the CHSTP corridor would result in slopes that fall below the minimum standard of maintaining a minimum velocity of 2 feet per second. The pipes under Church Avenue would need to be relocated 900' northwest and the pipe under Jensen Ave would need to be relocated 1,200' southeast in order to meet the design criteria in Section 6.6.1. Pump stations would be required for the gravity utilities to cross at a point where the bottom of the trench is 8 feet or less from the original ground. The liability of a pump failure and the subsequent flooding and sewage overflow that would occur upstream, and possibly spill in to the trench section, is much greater than encased pipes below the trench.

PROPOSED ALTERNATIVE DESIGN REQUIREMENT	Require 100+ year design life, plus casing, and increased inspections for all utilities crossing under a trench section deeper than 8 feet from original ground.

Part 3 – Impact Analysis

OPERATIONS	None identified
MAINTENANCE	None identified
INFRASTRUCTURE	None identified
RAILROAD SYSTEMS	None identified
RELIABILITY / FUNCTIONALITY	Would increase reliability compared to a pump option.
THIRD PARTY (Utility, Freight, Caltrans, RR, other)	The Fresno Metropolitan Flood Control District (FMFCD), owner and operator of the 84-inch storm drain, prefers this option to a pump station. The City of Fresno, owner and operator of the 30-inch and 48-inch sewer, prefers this option to a pump station. See Appendix B for meeting minutes.
SAFETY AND SECURITY	None identified
DIRECT COST	Accommodating the HSTP criteria for utilities crossing under a trench section would result in the cost and liability of pump failure and the associated flooding and sewage overflow upstream being placed on the Authority.
OTHER	None identified

Part 4 – Mitigation measures

OPERATIONS	None identified
MAINTENANCE	None identified
INFRASTRUCTURE	None identified
RAILROAD SYSTEMS	None identified
	Contribute to increased inspections of the pipes to ensure their integrity.

Part 5 – List of Supporting Documentation to Design Variance Request

ANALYSIS	N/A
PUBLICATION/STANDARD EXTRACTS	N/A
RISK ASSESSMENT	N/A
DRAWINGS	Layout and Elevation View
CALCULATIONS	N/A
EXPERT TESTIMONIALS	N/A
CORRESPONDENCE	FMFCD 8/15/2011 Meeting Minutes City of Fresno 10/21/2011 Meeting Minutes
OTHER	N/A

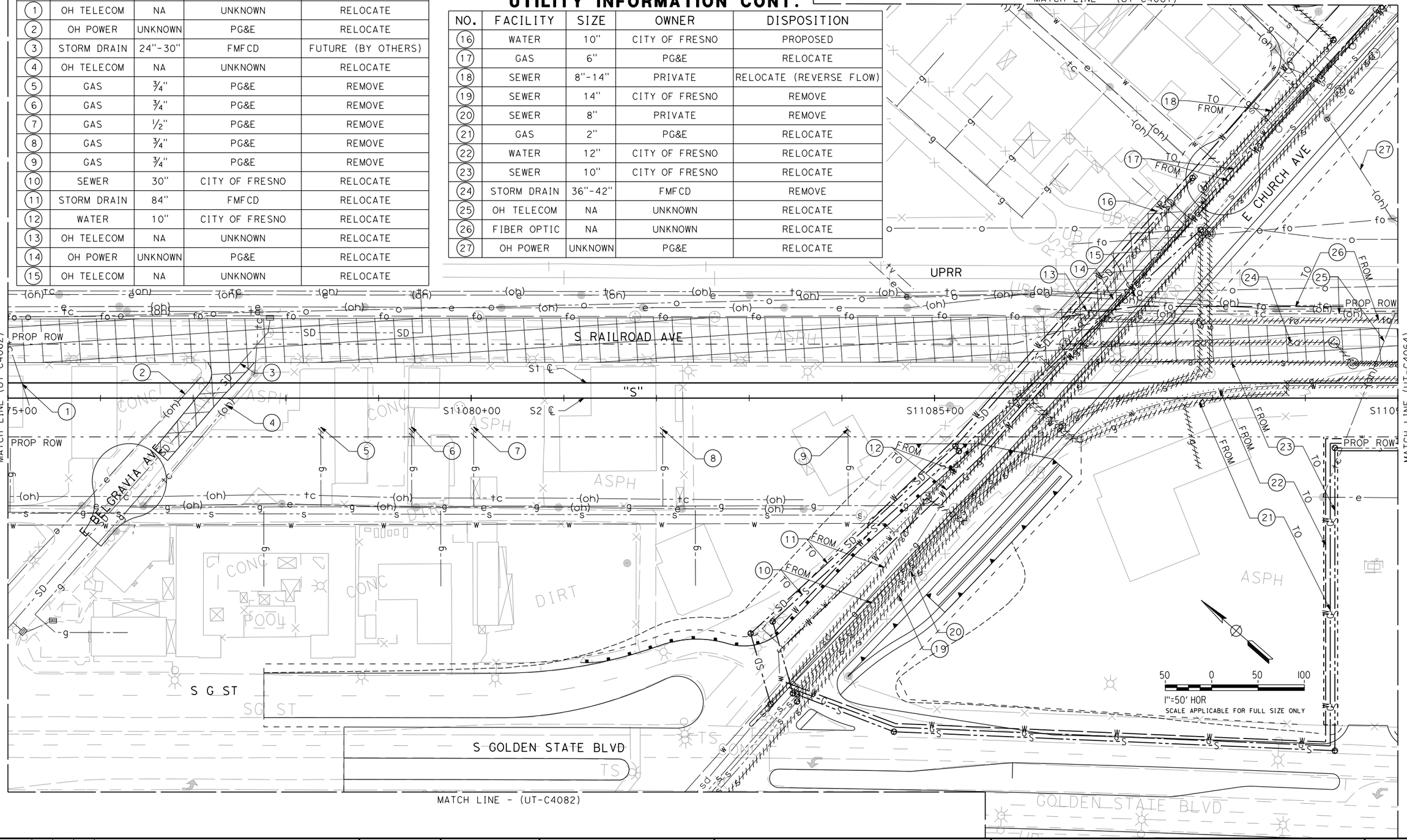
Appendix A – Drawings

UTILITY INFORMATION

NO.	FACILITY	SIZE	OWNER	DISPOSITION
1	OH TELECOM	NA	UNKNOWN	RELOCATE
2	OH POWER	UNKNOWN	PG&E	RELOCATE
3	STORM DRAIN	24"-30"	FMFCD	FUTURE (BY OTHERS)
4	OH TELECOM	NA	UNKNOWN	RELOCATE
5	GAS	¾"	PG&E	REMOVE
6	GAS	¾"	PG&E	REMOVE
7	GAS	½"	PG&E	REMOVE
8	GAS	¾"	PG&E	REMOVE
9	GAS	¾"	PG&E	REMOVE
10	SEWER	30"	CITY OF FRESNO	RELOCATE
11	STORM DRAIN	84"	FMFCD	RELOCATE
12	WATER	10"	CITY OF FRESNO	RELOCATE
13	OH TELECOM	NA	UNKNOWN	RELOCATE
14	OH POWER	UNKNOWN	PG&E	RELOCATE
15	OH TELECOM	NA	UNKNOWN	RELOCATE

UTILITY INFORMATION CONT.

NO.	FACILITY	SIZE	OWNER	DISPOSITION
16	WATER	10"	CITY OF FRESNO	PROPOSED
17	GAS	6"	PG&E	RELOCATE
18	SEWER	8"-14"	PRIVATE	RELOCATE (REVERSE FLOW)
19	SEWER	14"	CITY OF FRESNO	REMOVE
20	SEWER	8"	PRIVATE	REMOVE
21	GAS	2"	PG&E	RELOCATE
22	WATER	12"	CITY OF FRESNO	RELOCATE
23	SEWER	10"	CITY OF FRESNO	RELOCATE
24	STORM DRAIN	36"-42"	FMFCD	REMOVE
25	OH TELECOM	NA	UNKNOWN	RELOCATE
26	FIBER OPTIC	NA	UNKNOWN	RELOCATE
27	OH POWER	UNKNOWN	PG&E	RELOCATE



REV	DATE	BY	CHK	APP	DESCRIPTION

DESIGNED BY C. ALLEN
DRAWN BY S. KHAN
CHECKED BY M. POLISCHUK
IN CHARGE J. LABANOWSKI
DATE 06/06/12

PROPOSED PRELIMINARY DESIGN

NOT FOR CONSTRUCTION

URS | HMM | ARUP
CALIFORNIA HIGH-SPEED TRAIN

CALIFORNIA HIGH-SPEED RAIL AUTHORITY

CALIFORNIA HIGH-SPEED TRAIN PROJECT
SIERRA SUBDIVISION
PACKAGE 1C
UTILITIES
COMPOSITE UTILITY PLAN
E CHURCH AVE

CONTRACT NO.
DRAWING NO. UT-C4063
SCALE AS SHOWN
SHEET NO.

HSR 13-06 - EXECUTION VERSION

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UTILITY INFORMATION

NO.	FACILITY	SIZE	OWNER	DISPOSITION
1	STORM DRAIN	36"-42"	FMFCD	REMOVE
2	SEWER	10"-36"	CITY OF FRESNO	RELOCATE
3	GAS	2"	PG&E	RELOCATE
4	GAS	¾"	PG&E	REMOVE
5	FIBER OPTIC	N/A	UNKNOWN	RELOCATE
6	GAS	¾"	PG&E	REMOVE
7	GAS	2"	PG&E	REMOVE
8	OH POWER	UNKNOWN	PG&E	RELOCATE
9	GAS	¾"	PG&E	REMOVE
10	GAS	2"	PG&E	PROPOSED
11	SEWER	48"	CITY OF FRESNO	RELOCATE

UPRR

S RAILROAD AVE

S GOLDEN STATE BLVD

E JENSEN AVE

MATCH LINE (UT-C4064)

MATCH LINE (UT-C4066)

PROP ROW

S1 ℄

S2 ℄

"S"

S11110+00

S11115+00

TANK

ASPH

CONC

DIRT

1" = 50' HOR
SCALE APPLICABLE FOR FULL SIZE ONLY

HSR 13-06 - EXECUTION VERSION

REV	DATE	BY	CHK	APP	DESCRIPTION

DESIGNED BY C. ALLEN
DRAWN BY S. KHAN
CHECKED BY M. POLISCHUK
IN CHARGE J. LABANOWSKI
DATE 06/06/12

PROPOSED PRELIMINARY DESIGN

NOT FOR CONSTRUCTION

URS | HMM | ARUP
CALIFORNIA HIGH-SPEED TRAIN

CALIFORNIA
HIGH-SPEED RAIL AUTHORITY

CALIFORNIA HIGH-SPEED TRAIN PROJECT
SIERRA SUBDIVISION
PACKAGE 1C
UTILITIES
COMPOSITE UTILITY PLAN
STA. 11105+00 TO STA. 11120+00

CONTRACT NO.
DRAWING NO. UT-C4065
SCALE AS SHOWN
SHEET NO.

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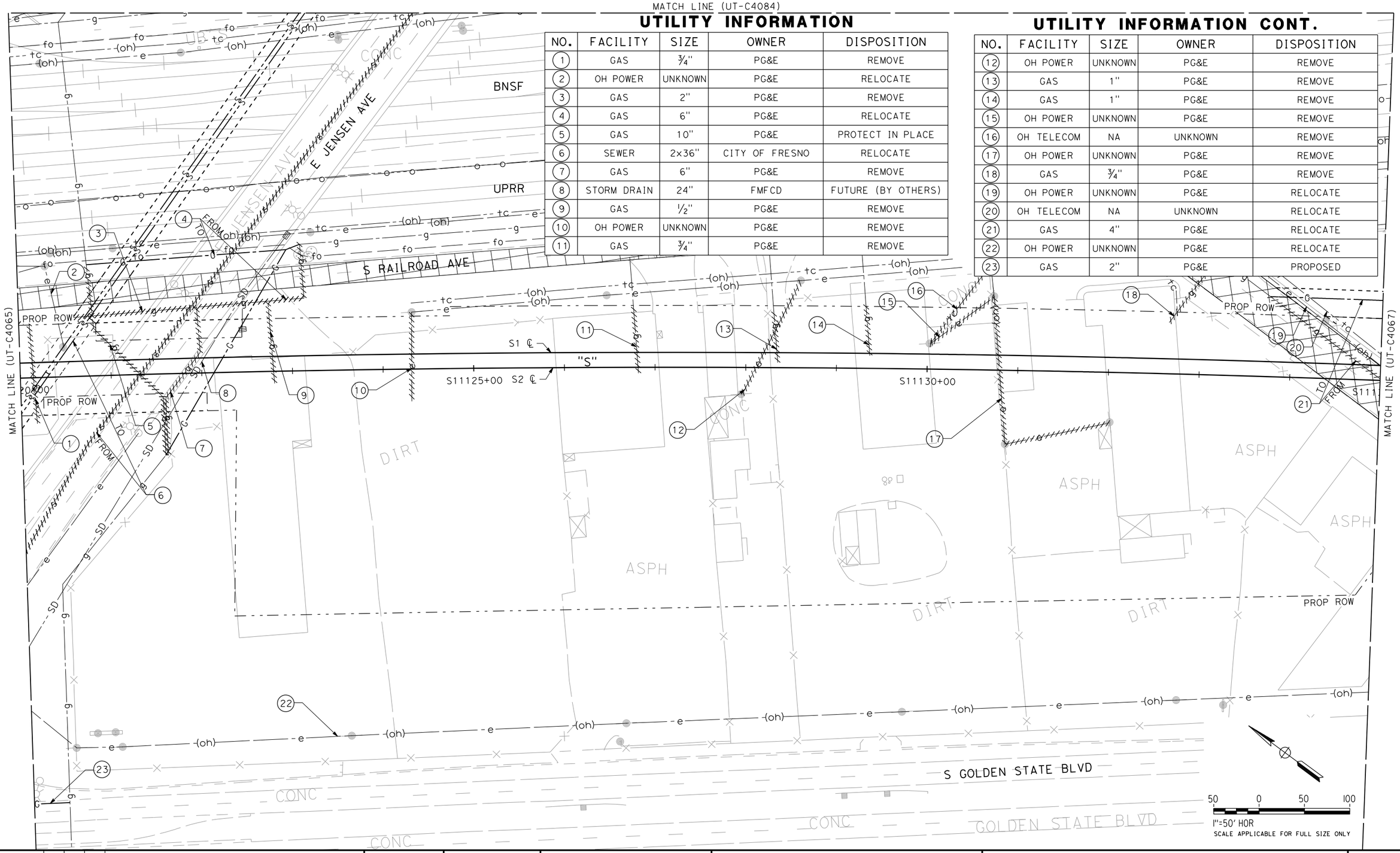
MATCH LINE (UT-C4084)

UTILITY INFORMATION

NO.	FACILITY	SIZE	OWNER	DISPOSITION
1	GAS	¾"	PG&E	REMOVE
2	OH POWER	UNKNOWN	PG&E	RELOCATE
3	GAS	2"	PG&E	REMOVE
4	GAS	6"	PG&E	RELOCATE
5	GAS	10"	PG&E	PROTECT IN PLACE
6	SEWER	2x36"	CITY OF FRESNO	RELOCATE
7	GAS	6"	PG&E	REMOVE
8	STORM DRAIN	24"	FMFCD	FUTURE (BY OTHERS)
9	GAS	½"	PG&E	REMOVE
10	OH POWER	UNKNOWN	PG&E	REMOVE
11	GAS	¾"	PG&E	REMOVE

UTILITY INFORMATION CONT.

NO.	FACILITY	SIZE	OWNER	DISPOSITION
12	OH POWER	UNKNOWN	PG&E	REMOVE
13	GAS	1"	PG&E	REMOVE
14	GAS	1"	PG&E	REMOVE
15	OH POWER	UNKNOWN	PG&E	REMOVE
16	OH TELECOM	NA	UNKNOWN	REMOVE
17	OH POWER	UNKNOWN	PG&E	REMOVE
18	GAS	¾"	PG&E	REMOVE
19	OH POWER	UNKNOWN	PG&E	RELOCATE
20	OH TELECOM	NA	UNKNOWN	RELOCATE
21	GAS	4"	PG&E	RELOCATE
22	OH POWER	UNKNOWN	PG&E	RELOCATE
23	GAS	2"	PG&E	PROPOSED



REV	DATE	BY	CHK	APP	DESCRIPTION

DESIGNED BY C. ALLEN
DRAWN BY S. KHAN
CHECKED BY M. POLISCHUK
IN CHARGE J. LABANOWSKI
DATE 06/06/12

PROPOSED PRELIMINARY DESIGN

NOT FOR CONSTRUCTION

URS | HMM | ARUP
CALIFORNIA HIGH-SPEED TRAIN

CALIFORNIA HIGH-SPEED RAIL AUTHORITY

CALIFORNIA HIGH-SPEED TRAIN PROJECT
SIERRA SUBDIVISION
PACKAGE 1C
UTILITIES
COMPOSITE UTILITY PLAN
STA. 11120+00 TO STA. 11135+00

CONTRACT NO.
DRAWING NO. UT-C4066
SCALE AS SHOWN
SHEET NO.

HSR 13-06 - EXECUTION VERSION

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UTILITY INFORMATION

NO.	FACILITY	SIZE	OWNER	DISPOSITION
1	SEWER	48"	CITY OF FRESNO	RELOCATE

ASPH
DIRT
CONC
RAMP
JENSEN AVE
E JENSEN AVE
S SUNLAND AVE
BNSF
FROM
TO
MATCH LINE (UT-C4066)

50 0 50 100
1"=50' HOR
SCALE APPLICABLE FOR FULL SIZE ONLY

HSR 13-06 - EXECUTION VERSION

carlton_allen 6/1/2012 4:08:41 PM CAHSRP-r1.tbl pdf-half_MACRO.PLT P:\27560808\03-RPLANS\MASTERS\30% Procurement\Sheet Files\Package #1\UTC\FB-UT-C4084-PK1C.dgn

REV	DATE	BY	CHK	APP	DESCRIPTION

DESIGNED BY C. ALLEN
DRAWN BY S. KHAN
CHECKED BY M. POLISCHUK
IN CHARGE J. LABANOWSKI
DATE 06/06/12

PROPOSED PRELIMINARY DESIGN

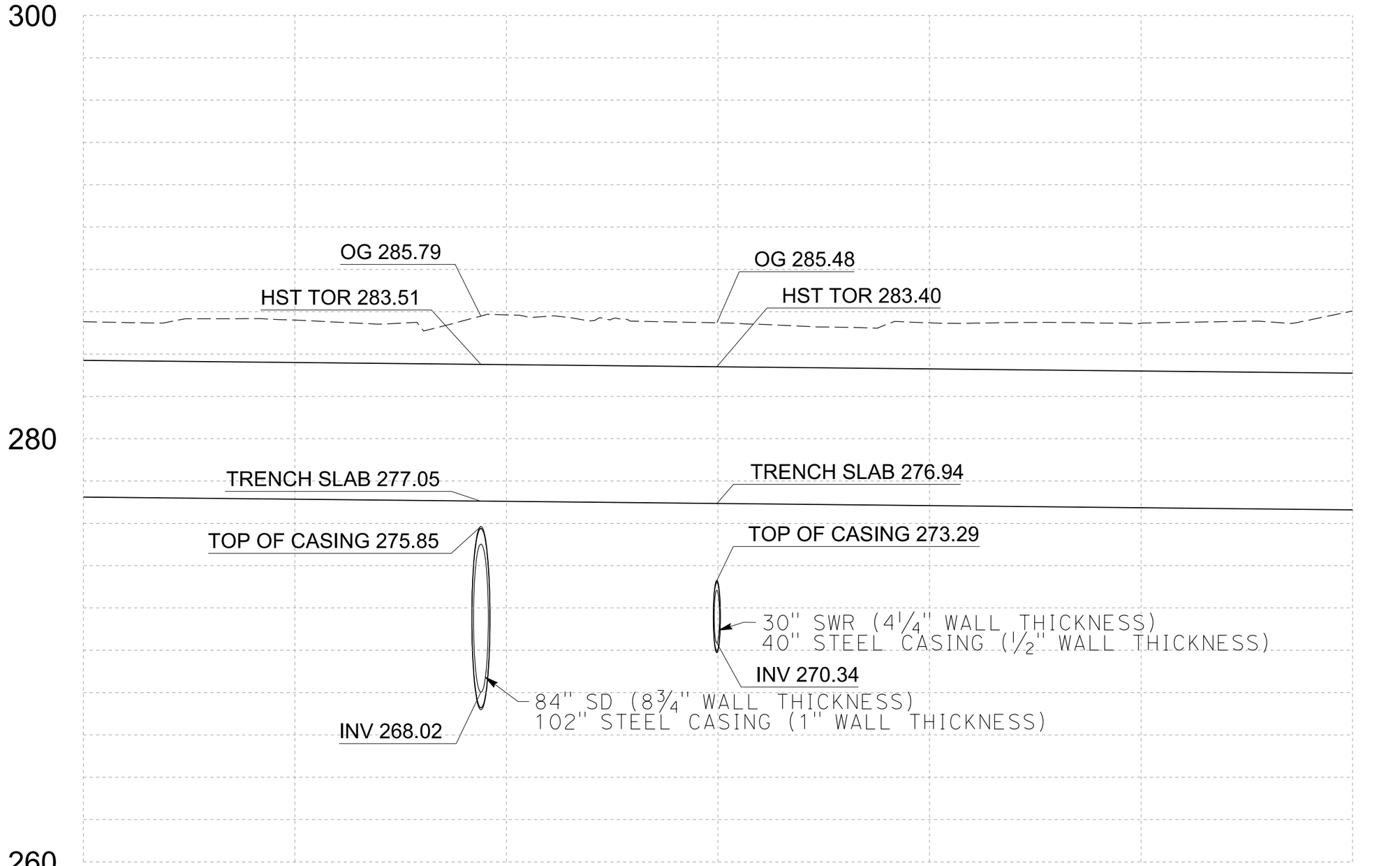
NOT FOR CONSTRUCTION

URS | HMM | ARUP
CALIFORNIA HIGH-SPEED TRAIN

CALIFORNIA HIGH-SPEED RAIL AUTHORITY

CALIFORNIA HIGH-SPEED TRAIN PROJECT
SIERRA SUBDIVISION
PACKAGE 1C
UTILITIES
COMPOSITE UTILITY PLAN
E JENSEN AVE

CONTRACT NO.
DRAWING NO. UT-C4084
SCALE AS SHOWN
SHEET NO.



URS | HMM | ARUP
CALIFORNIA HIGH-SPEED TRAIN

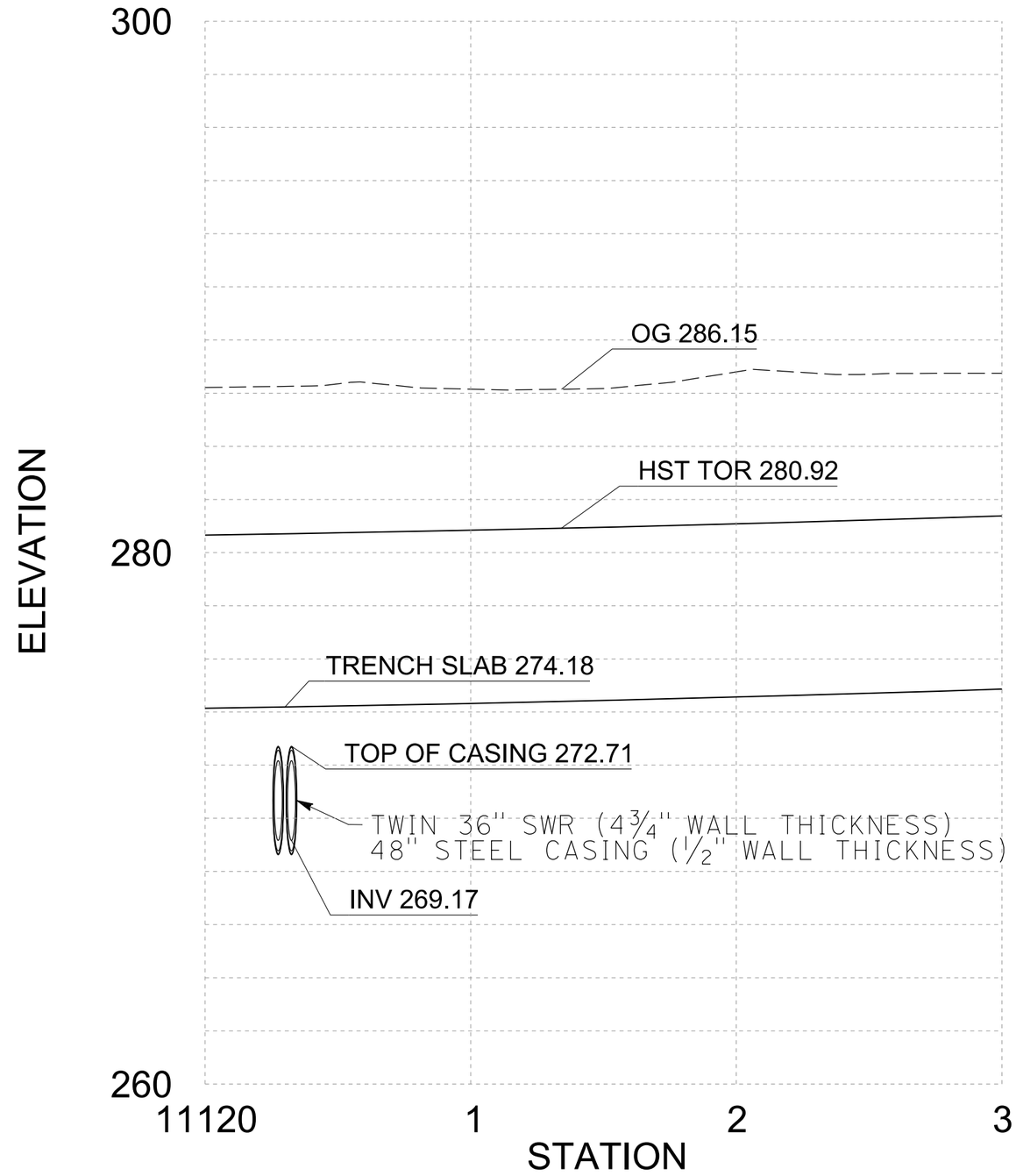
CALIFORNIA
HIGH-SPEED RAIL AUTHORITY

CALIFORNIA HIGH-SPEED TRAIN PROJECT
FRESNO TO BAKERSFIELD

ELEVATION VIEW
CHURCH AVENUE UTILITY CROSSINGS

HSR 13-06 - EXECUTION VERSION

$USER $DATE $TIME $REQUEST



URS | HMM | ARUP
CALIFORNIA HIGH-SPEED TRAIN

CALIFORNIA
HIGH-SPEED RAIL AUTHORITY

CALIFORNIA HIGH-SPEED TRAIN PROJECT
FRESNO TO BAKERSFIELD

ELEVATION VIEW
JENSEN AVENUE UTILITY CROSSINGS

$USER $DATE $TIME $REQUEST

Appendix B – Meeting Minutes

Fresno Metropolitan Flood Control District
August 15, 2011
Meeting Notes

HST Section: Fresno to Bakersfield

Meeting Date: August 15, 2011

Location: FMFCD Office, 5469 E Olive Ave, Fresno, CA 93727

Purpose: Coordination

Participants: Jerry Lakeman, 559-456-3292, FMFCD
Mark Will, 559-456-3292
Alan Hofmann, 559-456-3292
David Pomaville, 559-456-3292
Melisa Bittancourt, 916-567-2568, PB
Johnny Kuo, 415-243-4683
Scott Lanphier, 916-915-2700
Garry Horton, By Phone, 916-784-3900, URS
James Labanowski, 916-784-3900
Carlton Allen, 916-784-3900
Stephen Burges, 415-957-9445, ARUP
Grant Schlereth, 415-946-0246
Robert Henderson, By Phone, 714-435-6143, CH2M Hill

Prepared by: Carlton Allen

Action Items:

- Scott will coordinate with Alan on agreement
- FMFCD to provide soil data
- FMFCD to provide existing drainage flows and data

Discussion of Issues:

- James gave the introduction/background of design development process
- FMFCD prepared a solution as well for discussion.
    - The pipe would cross under the trench in its existing horizontal location and outlet into the basin. The outlet of the pipe would be lower than the existing floor.
    - A concrete trench/spillway would convey the water into the basin. The spillway would have to be wide enough for maintenance to occur (using a Bobcat to clear silt).
    - Proposed to expand the basin north under the Belmont OH.
- James then led the discussion on the five alternatives proposed in the memo
    - Alternative 1 (Gravity Under HST, Deepen Basin)
        - Similar to FMFCD's proposal
        - Increased maintenance compared to existing

Fresno Metropolitan Flood Control District
August 15, 2011
Meeting Notes

  - Alternative 2 (Pumped Over HST)
    - Pump station on east side of UPRR is an issue
    - FMFCD would prefer to dismiss this alternative based on the need to maintain more pumps
  - Alternative 3 (Gravity Under HST, Reroute System)
    - Additional headloss from extended length of pipe a concern for FMFCD
  - Alternative 4 (Sag Culvert Under HST)
    - FMFCD prefers their spillway idea for ease of maintenance
  - Alternative 5 (Gravity Over HST Without Pump)
    - FMFCD agreed that is not a feasible solution
  - FMFCD considered Alternatives 1 and 3, along with their solution as the feasible options
- Surface Drainage
  - FMFCD, FID, and City of Fresno must approve discharges to Dry Creek.
  - Pumping directly to Dry Creek was not considered favorable.
  - Flow from HST system must be attenuated to pre improvement rate before it enters the FMFCD system.
    - FMFCD will provide Q they will accept into their system
- The Belmont underpass has not flooded since the 96" storm drain was built (2001).
- FMFCD is also concerned about road improvements and where flows will go.
- FMFCD would review design at no expense.
- FMFCD would like to be paid for work associated with the relocation of existing facilities.
- FMFCD would assess the Authority a drainage fee
- Who will maintain new basins that are constructed by the HSTP?
- Jerry said that FMFCD has approx. 1.5 million CY of material east of town in basin sites that can be excavated.
- FMFCD has soil samples for most basin sites.
- There are also several basins to the south and west of town that have available material to be excavated.
- One location has higher than background lead levels
  - Would provide this material at no cost
- FMFCD would like to tell contractors they have available fill, how can they do this?
  - How will they know who is bidding on the project?
    - PMT discussed the Industry Forum happening on September 8th.
- FMFCD could not find description in EIR of borrow material.
- Basin EH – meeting with between MF team and FMFCD to follow
- HSTP schedule was discussed.

URS/HMM/Arup Joint Venture

California High-Speed Train Project
Fresno - Bakersfield

City of Fresno
October 21, 2011
Meeting Notes

HST Section: Fresno to Bakersfield

Meeting Date: October 21, 2011

Location: City Hall, 2600 Fresno Ave, Fresno, CA

Purpose: Utility Coordination

Participants: Scott Mozier, 559-621-8811, City of Fresno
Doug Hecker, 559-621-8554
Robert Anderson, 559-621-8610
James Labanowski, 916-784-3900, URS
Mark Polischuk, 916-784-3900
Johnny Kuo, 415-243-4683, PB

Prepared by: Mark Polischuk

Action Items:

- URS to prepare a large strip map of proposed utility work for the City of Fresno.
- City will double check the manholes inverts along the sewer line in question near the Dry Creek Canal.
- URS to check benchmarks of topo survey done to compare to City of Fresno information that may identify where the differential between elevations is coming from.
- URS to check in with structures to identify whether adjustments could be made to allow for the sewer line.
- URS to check and confirm the sewer lines at Church Ave including two private lines.

Discussion of Issues:

- James gave the introduction/background of utility development process. Emphasized that we would like to focus on the sewer line that is in conflict with the trench structure near Dry Creek Canal.
    - City wanted to know if the structure could be adjusted to allow the sewer line to pass by without conflict.
    - City also suggested that we could look at the existing sewer line facility in greater detail and see what sort of impact would occur if we were to chase the elevation differential needed back through the system to make up the difference. Also included pipe replacement and possibly size in the analysis.
    - City suggested looking at placing a siphon in the canal at the point of conflict to avoid the sewer line.
    - City was highly opposed to a lift station and would like to avoid it at all costs.
- It was noted that all water lines need two points of service for each parcel. A consideration for all water line proposals.

California High-Speed Train Project

DESIGN VARIANCE COVER SHEET

Design Variance Request Number: URS-INF-2-0012

Design Variance Request Title:

Vertical Clearance Beneath State Route 41 and E Jensen Bypass

Prepared by:

URS/HMM/Arup a Joint Venture Company	Aug 08, 2012
Regional Consultant	Date

PMT Review:

Richard Schmedes	Aug 24, 2012
Systems	Date
John Chirco	Aug 24, 2012
Infrastructure	Date
Joseph Metzler	Aug 23, 2012
Operations/Maintenance/Safety	Date
Frank Banko	Jun 13, 2012
Rolling Stock	Date
Oliver Hoehne	Aug 17, 2012
System Integration	Date

PMT Recommended:

Thomas Tracy	Aug 24, 2012
PMT Regional Manager	Date

PMT Approval:

Ken Jong	Aug 24, 2012
Engineering Manager	Date

Agency Concurrence:

CHSR Authority Chief Engineer	Date

CHSR Authority Chief Engineer

CHST DESIGN VARIANCE REQUEST FORM

Part 1 – Design Variance Request Information

Title/Subject: Vertical Clearance Beneath State Route 41 and E Jensen Bypass

Number: **URS-INF-2-0012** **Revision:** **1**

Contract Name & Number (Final Design): HSR 06-0003

Region: Fresno - Bakersfield

Location: Fresno

Regional Consultant's / Third Party Design Drawing Reference: TT-D1018 - TT-D1021 and TT-D3012 and TT-D3013 supplemented with alternative vertical alignments

Date Submitted to RMT & PMT

PREPARED / SUBMITTED BY: NAME: Richard Coffin COMPANY: URS/HMM/Arup A Joint Venture Company SIGNATURE: DATE: 08/08/12	REGISTERED PROFESSIONAL ENGINEER RICHARD STUART COFFIN C51265 EXP 9-30-13 CIVIL ENGINEERING STATE OF CALIFORNIA (Engineering Seal)

**Note design variance numbers will follow the same convention:* "ABC" will abbreviate the name of the firm submitting the variance, "DEF" abbreviates the name of firm receiving the variance request, "X" is the revision number starting from 0, and the last four numbers count the number of total submittals staring from one.

Part 2 – Design Variance Request Information

CHSTP DESIGN REQUIREMENT Include reference to drawings, design criteria, technical memos, specifications	DRAFT DD-CV-010. Minimum Clearance – Grade Separated Structures
DESIGN CRITERIA REQUIRING A VARIANCE	Draft drawing DD-CV-010 requires the vertical clearance beneath existing structures to be 27 ft for design speeds greater than 125 mph, and 24 ft for design speeds less than or equal to 125 mph. Note: The current TM 1.1.21, "Typical Cross Sections for 15% design", Rev 0 dated 04/07/09 required 24 ft vertical clearance beneath all existing structures.
REASON FOR REQUESTING A VARIANCE	A minimum of 24.50 ft vertical clearance would be provided for the HST alignment passing beneath two existing structures at 220 mph operating speed. Plan and profiles of the proposed design are included in Appendix A. A clearance of 27ft to the two structures could be provided, but this would not be fully compliant with all criteria and would have additional impacts. The vertical alignment is constrained by passing underneath the existing State Route (SR) 41 and E Jensen Bypass overbridges. The vertical clearance proposed beneath SR 41 and E Jensen Bypass is greater than 24 ft, but less than 27 ft. The proposed trench in this area would fall within a FEMA designated zone AH 100 year floodplain that has a maximum depth of 3 ft above ground level. The track would be below ground level and is therefore below the 100 year flood level. A separate drainage system would be required in the trench for storm water due to the shallow longitudinal gradient. This condition does not require a design variance. SR 41 comprises separate structures for the northbound and southbound roadways. The bridges were completed in 1966. Each structure is 65 ft wide with a 45 ft opening between the structures measured along the HST centerline. Each deck is 49 ft wide when measured perpendicular to the structure. Due to the superelevation on the roadway, the point of minimum vertical clearance is on the western edge of the northbound roadway. The location of the minimum horizontal clearance to SR 41 columns is also at the western edge of the northbound

	roadway, as shown in Section 23 of Appendix B. Minimizing the impact to the existing E Jensen Bypass bridge was a key consideration for the Program Management Team (PMT) during the cost containment phase and following discussions with the City of Fresno. The bridge was completed in 1964 and a seismic retrofit was carried out in 2011-2. To pass beneath the existing bridge, the HST alignment is approximately 7 ft below grade. A minimum of 24.50 ft of vertical clearance would be provided between the underside of the structure and the top of the high rail (southbound track, outside rail). The existing structure is 100 ft wide when measured along the HST centerline. The vertical alignment would pass underneath the existing bridge at E Jensen Bypass and rise to be on a structure over Golden State Boulevard (GSB). A separate design variance (DVR URS-INF-1-0005) has been submitted for the overlap of the vertical curve with a horizontal spiral due to the constrained geometry in this location. For the alignment underneath both SR 41 and E Jensen Bypass, it is proposed to design the Overhead Contact System (OCS) to accommodate the reduced vertical clearance. The standard contact wire height would be maintained and the feeder wire lowered as needed. There are two other relevant design variances in this area and all should be considered together. DVR URS-INF-1-0005 requests a variance for a curve with a radius of 21,288.5 ft and an overlap of a horizontal spiral with a vertical curve. DVR URS-INF-1-0011 requests a variance for reduced cover to the transverse gravity utilities under the trench. If this design variance (reduced clearance) is not accepted, an alternative solution would be required for the utilities under the trench with pump stations instead of gravity flow. Therefore, DVR URS-INF-1-0011 is dependent on approval of this DVR.
JUSTIFICATION FOR VARIANCE	At SR 41 the proposed design minimum vertical clearance between the soffit of the structure and the top of the rail would be 24.35 ft. The minimum lateral offset from an HST track to an existing column is 22.01 ft. These dimensions are measured from a composite of as-built drawings and a point cloud survey received from the City of Fresno. There are two potential OCS solutions to

	accommodate the reduced headroom. The first is to place the OCS masts outside both structures and span both structures. This would require the OCS to span approximately 200 ft between supports. The second is to install an OCS mast between the northbound and southbound structures and span each structure individually. The masts would be offset from each other to account for the skew of the existing structures. The OCS masts on the outside of the structures could be in line with each other. In both cases a constant contact wire height could be maintained with standard system height and electrical clearances. At E Jensen Bypass, the existing structure is 100 ft wide when measured along the HST centerline. The minimum vertical clearance (shown in Appendix B) would be 24.50 ft between the top of the rail and the underside of the structure, based on as-built drawings. The minimum lateral offset to an existing column is 22.37 ft. The OCS masts can be placed on either side of the structure. TM 3.2.1 requires 1 ft 0.6 in of static electrical clearance. The electrical clearance will be achievable, as the messenger wire at the support will typically be at 22 ft 8 in. This gives a clearance of 1 ft 4 in, which is greater than that required by TM 3.2.1. The clearance will be increased further, due to the natural sag of the messenger wire. The exact clearance will only be known when the OCS wires, tensions, etc., are defined. In all cases, beneath SR 41 and E Jensen Bypass, the feeder wires will need to be lowered from their normal position above the cantilevers to pass under the structures. In the event the OCS masts need to be placed under the structures, the system height would need to be reduced. It is not possible to maintain the nominal system height (typically 5 ft 3 in for 220 mph lines) at the normal contact wire height (17 ft 5 in) when supported from a mast positioned under the road bridge structures. It is anticipated that the system height would need to be reduced between 1 and 2 feet beneath the structures.

PROPOSED ALTERNATIVE DESIGN REQUIREMENT	A vertical clearance of 27 ft at SR 41 and E Jensen Bypass could be achieved by lowering the HST vertical alignment by 3 ft or reconstructing the roadway bridges 3 ft higher than existing. Lowering the alignment would lengthen and deepen the trench and preclude the use of gravity utilites under the trench. Reconstructing SR 41 and E Jensen Bypass would introduce a significant costto the project. **Proposed Design to Meet 27 ft Clearance Requirement (No 1): Lower HST alignment** An alignment achieving 27 ft vertical clearance is shown in Appendix A (red line). The vertical alignment would be 3 ft lower between SR 41 and E Jensen Bypass. The length and depth of the trench would increase. Deepening the trench would increase the potential buoyancy of the structure, requiring an increase in the size of the structure or provision of an anchor system to oppose the uplift force. Lowering the alignment 3 feet in the vicinity of the SR 41 columns would further expose the column foundations. This would require closer coordination with the bridge owner, California Department of Transportation (Caltrans), and could require additional assessment and mitigation measures. Deepening the trench would conflict with storm drain and sewer utilities at Church Avenue and E Jensen Bypass. The utilities would need to be lowered to pass beneath the deeper trench, requiring either pumps or siphons to connect into the existing network. **Proposed Design to Meet 27 ft Clearance Requirement (No 2): Reconstruct road bridges 3 ft higher** Reconstructing SR 41 would introduce a substantial cost to the project. The disruption during the reconstruction would be considerable and would require further coordination with Caltrans, and possible project construction delays. Reconstructing E Jensen Bypass bridge would introduce a substantial cost to the project and impact the existing intersection with GSB. The City of Fresno would require E Jensen Bypass to be reconnected with GSB, which would require the intersection to be reconstructed. Provision of an

	interchange to maintain this connection would require junction realignment and increase traffic disruption during construction. To replace the existing bridges for SR 41 and Jensen Avenue, significant traffic disruption would be caused by the need for of diversion routes and a temporary reduction and traffic capacity. To minimize the impact on existing traffic the construction could be staged in smaller sections, but this would increase both the cost and duration of the construction. The impact to the schedule of introducing major roadway works in this area could pose a risk to the schedule defined in the EIR/EIS.

Part 3 – Impact Analysis

OPERATIONS	There are no operational impacts if the OCS system height has to be reduced.
MAINTENANCE	There is no change to the maintenance requirements of the OCS if the system height is reduced.
INFRASTRUCTURE	The reduced flexibility in OCS design would be minimal. Full height masts could be sited outside the overpass structures. Reduced height masts could be sited beneath the existing structures if the system height is reduced. The feeder wire height would be reduced in all cases to fit underneath the existing structures.
RAILROAD SYSTEMS	None identified
RELIABILITY / FUNCTIONALITY	The existing structures at SR 41 and Jensen Avenue are likely to require replacement during the design life of CHSR. New structures could be designed to meet or exceed the design life of the CHSR infrastructure.
THIRD PARTY (Utility, Freight, Caltrans, RR, other)	Pumped drainage of the trench storm water and flood water require coordination with local flood protection agencies under all alternatives. The OCS masts should be positioned at a nominal distance to avoid interaction with the overpass structures. The OCS wires should be positioned to provide electrical clearances to the structures. If an OCS mast is to be positioned under a structure, there may be an issue with clashes of the mast/structure foundations. In addition, it may be more difficult to maintain the underside of the structure. **Proposed Design to Meet 27 ft Clearance Requirement (No 1): Lower HST alignment** Pump stations would be required for the gravity

<table>
<tr><td></td><td>utilities crossing the trench. Both the Fresno Metropolitan Flood Control District and the City of Fresno who own and operate the existing utilities have stated their preference for gravity systems rather than pumped stations. Further details are provided in DVR URS-INF-1-0011.

Proposed Design to Meet 27 ft Clearance Requirement (No 2): Reconstruct road bridges 3 ft higher

Raising SR 41 and Jensen Ave profile would require coordination and approval by the city and Caltrans. There would be resulting impacts to the Golden State Boulevard interchange with Jensen Ave.</td></tr>
<tr><td>SAFETY AND SECURITY</td><td>The OCS masts should be positioned at a nominal distance from the structures to prevent persons from climbing from one structure to the other. The OCS wires and masts should have sufficient clearances to avoid interference from persons on the road structures.</td></tr>
<tr><td>DIRECT COST</td><td>The option with (minimum) 24.5 ft clearance would have the lowest infrastructure cost, so is considered the baseline in this DVR. Additional costs of significant additional infrastructure elements are presented to allow comparison between the options, not as a full cost breakdown.

Neither siting the OCS masts outside the structures and lowering the feeder wire height, nor siting the OCS masts beneath the structures and lowering the system height would have a significant cost impact.

<table>
<tr><th colspan="2">Proposed Design with Variance for 24.5 ft Clearance</th></tr>
<tr><td>No additional trench cost
No pumped utilities
No reconstruction of highway bridges</td><td></td></tr>
</table>

<table>
<tr><th colspan="2">Proposed Design to Meet 27 ft Clearance Requirement (No 1): Lower HST alignment</th></tr>
<tr><td>Additional cost of deeper, longer trench</td><td>$11.1m</td></tr>
<tr><td>Replace 3 no gravity utilities with pumped systems</td><td>$9m + $900k/20 years</td></tr>
<tr><td>Other</td><td>General maintenance of pump stations</td></tr>
</table>
</td></tr>
</table>

	Proposed Design to Meet 27 ft Clearance Requirement (No 2): Reconstruct road bridges 3 ft higher Demolish existing and reconstruct SR 41 bridge: $22.2m Demolish existing and reconstruct Jensen Ave bridge: $28.4m Other: Changes beyond DEIR/DEIS footprint requiring reevaluation, cost associated with additional engineering, environmental and construction delays.
OTHER	None identified

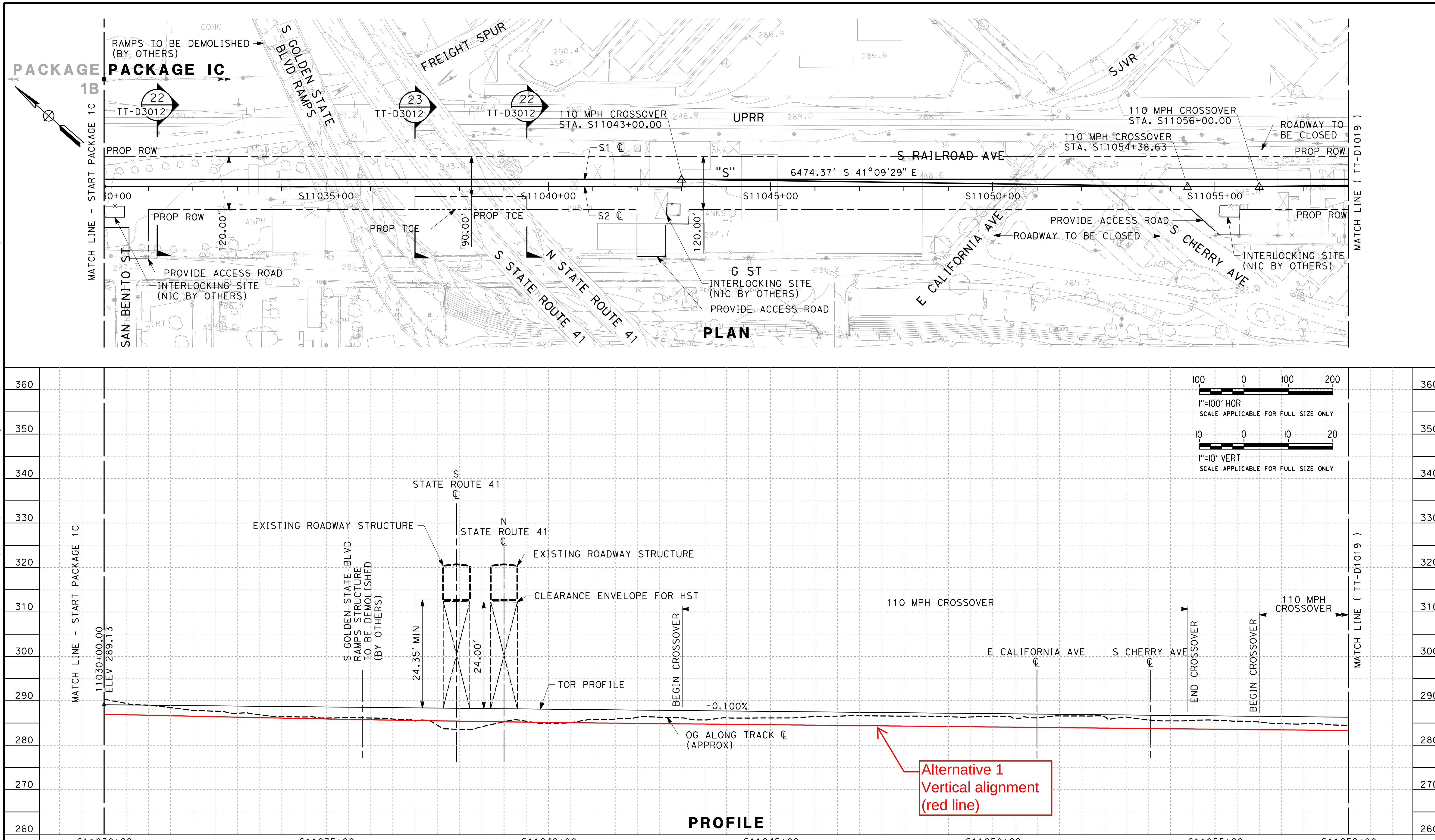
Part 4 – Mitigation measures

OPERATIONS	None required
MAINTENANCE	Install OCS masts outside of structures to avoid additional maintenance constraints associated with masts beneath existing structures.
INFRASTRUCTURE	Install OCS masts outside of structures for ease of installation.
RAILROAD SYSTEMS	None required

Part 5 – List of Supporting Documentation to Design Variance Request

ANALYSIS	N/A
PUBLICATION/STANDARD EXTRACTS	DRAFT DD-CV-010. Minimum Clearance – Grade Separated Structures (received 05/09/12)
RISK ASSESSMENT	N/A
DRAWINGS	Alignment plan and profile drawings TT-D1018 through TT-D1021 supplemented with alternative vertical alignment Typical sections TT-D3012 and TT-D3013 As-built drawings of SR 41 and Jensen Avenue bridges. Seismic retrofit drawings of Jensen Avenue.
CALCULATIONS	N/A
EXPERT TESTIMONIALS	N/A
CORRESPONDENCE	N/A
OTHER	N/A

Appendix A – Plan and Profile Drawings



DESIGNED BY	K. SEYMOUR
DRAWN BY	P. TONKIN
CHECKED BY	D. HUNT
IN CHARGE	R. COFFIN
DATE	06/06/12

REV | DATE | BY | CHK | APP | DESCRIPTION

PROPOSED PRELIMINARY DESIGN

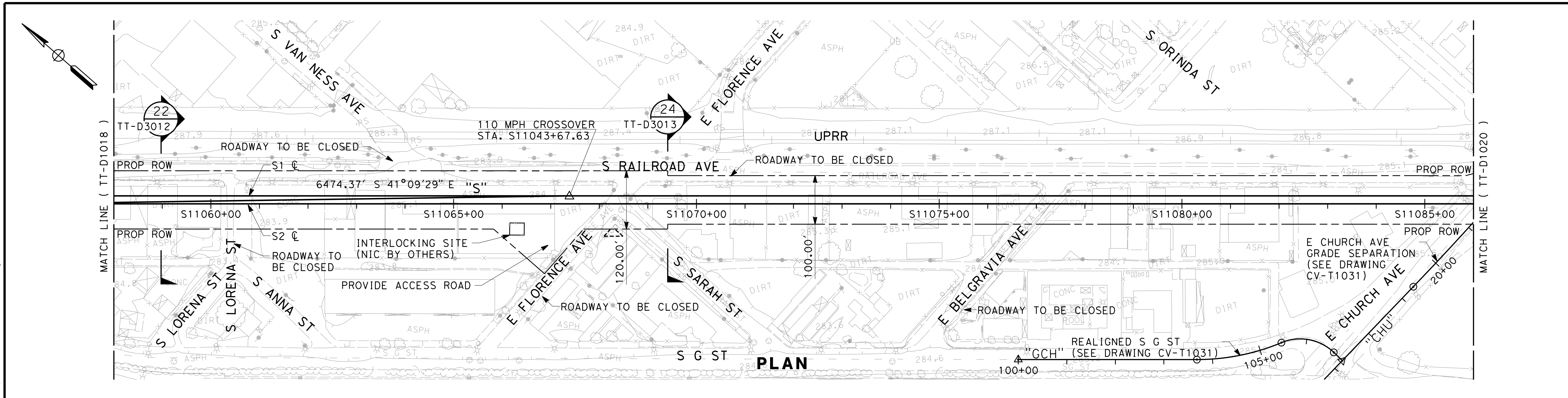
NOT FOR CONSTRUCTION

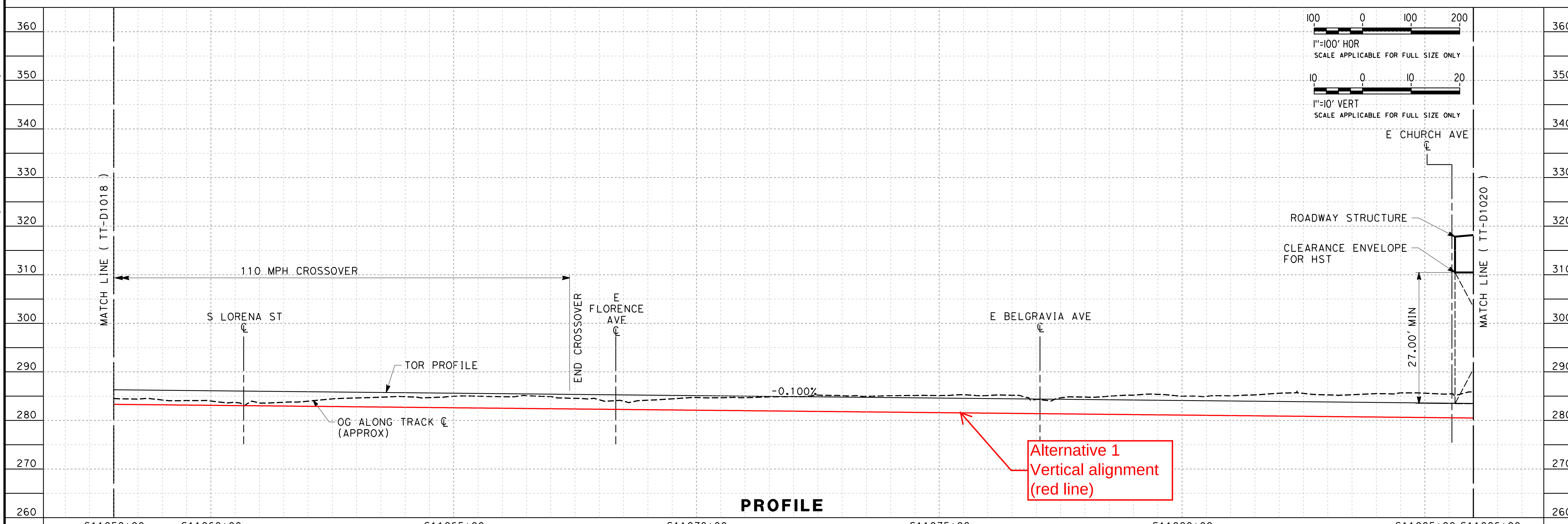
URS | HMM | ARUP — California High-Speed Train

CALIFORNIA HIGH-SPEED RAIL AUTHORITY

CALIFORNIA HIGH-SPEED TRAIN PROJECT
SIERRA SUBDIVISION
PACKAGE 1C
TRACK GUIDEWAY
PLAN AND PROFILE
STA. 11030+00 TO STA. 11058+00

CONTRACT NO.
DRAWING NO. TT-D1018
SCALE AS SHOWN
SHEET NO.





REV	DATE	BY	CHK	APP	DESCRIPTION

DESIGNED BY K. SEYMOUR
DRAWN BY P. TONKIN
CHECKED BY D. HUNT
IN CHARGE R. COFFIN
DATE 06/06/12

PROPOSED PRELIMINARY DESIGN

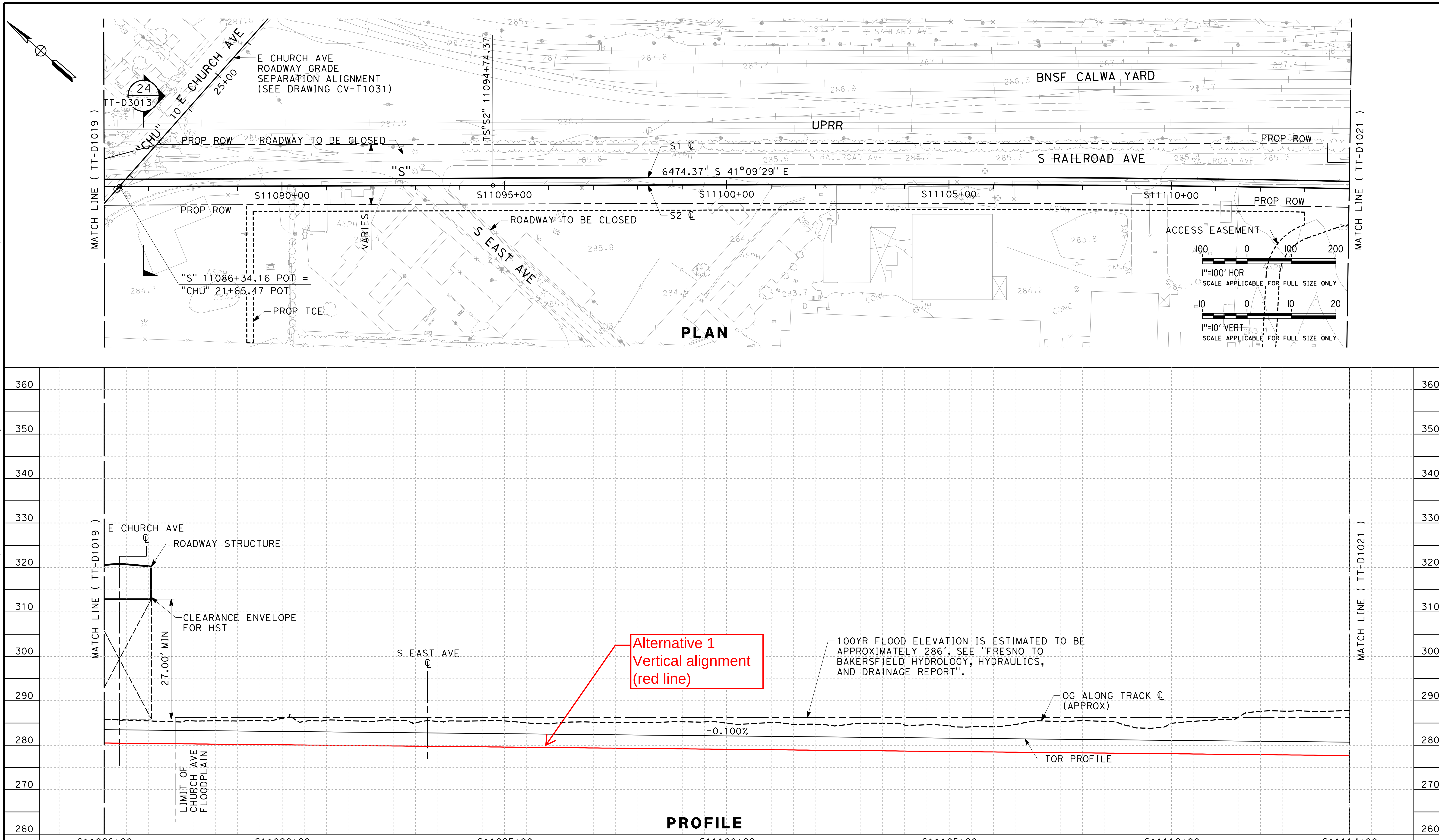
NOT FOR CONSTRUCTION

URS | HMM | ARUP
CALIFORNIA HIGH-SPEED TRAIN

CALIFORNIA
HIGH-SPEED RAIL AUTHORITY

CALIFORNIA HIGH-SPEED TRAIN PROJECT
SIERRA SUBDIVISION
PACKAGE 1C
TRACK GUIDEWAY
PLAN AND PROFILE
STA. 11058+00 TO STA. 11086+00

CONTRACT NO.
DRAWING NO. TT-D1019
SCALE AS SHOWN
SHEET NO.



REV	DATE	BY	CHK	APP	DESCRIPTION

DESIGNED BY K. SEYMOUR
DRAWN BY P. TONKIN
CHECKED BY D. HUNT
IN CHARGE R. COFFIN
DATE 06/06/12

PROPOSED PRELIMINARY DESIGN

NOT FOR CONSTRUCTION

URS | HMM | ARUP — California High-Speed Train

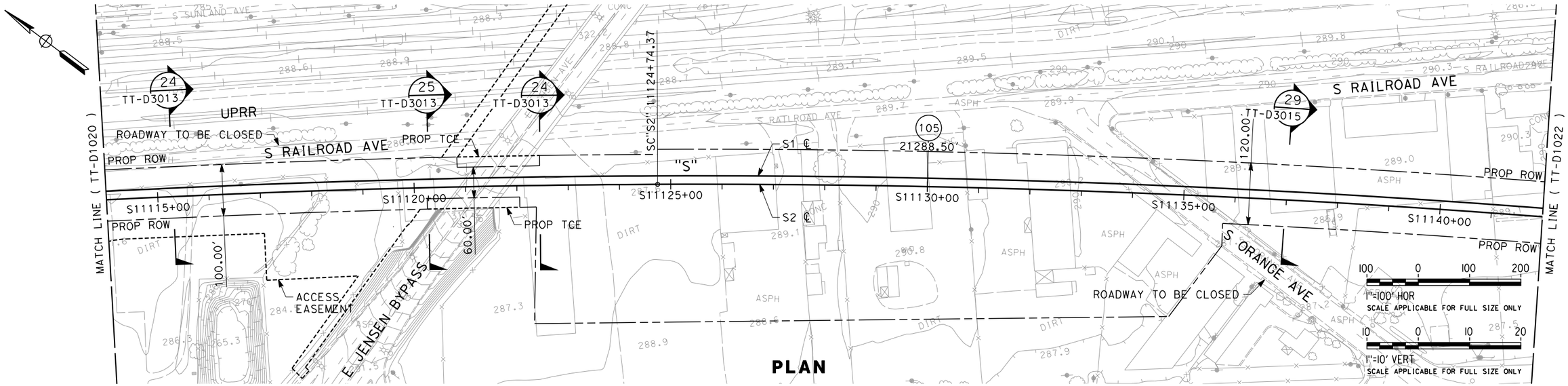
CALIFORNIA HIGH-SPEED RAIL AUTHORITY

CALIFORNIA HIGH-SPEED TRAIN PROJECT
SIERRA SUBDIVISION
PACKAGE 1C
TRACK GUIDEWAY
PLAN AND PROFILE
STA. 11086+00 TO STA. 11114+00

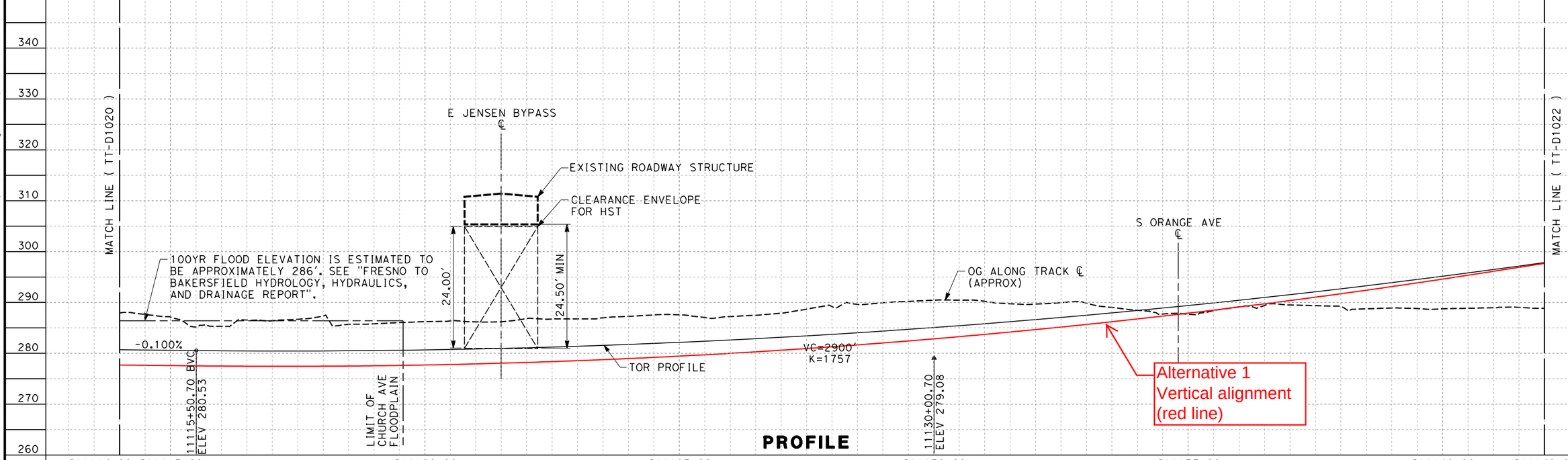
CONTRACT NO.
DRAWING NO. TT-D1020
SCALE AS SHOWN
SHEET NO.

HSR 13-06 - EXECUTION VERSION

keith.seymour 6/4/2012 6:19:25 PM CAHSRP-r1.tbl PDF_half_black_200dpi



PLAN



PROFILE

REV	DATE	BY	CHK	APP	DESCRIPTION

DESIGNED BY K. SEYMOUR
DRAWN BY P. TONKIN
CHECKED BY D. HUNT
IN CHARGE R. COFFIN
DATE 06/06/12

PROPOSED PRELIMINARY DESIGN

NOT FOR CONSTRUCTION

URS | HMM | ARUP
CALIFORNIA HIGH-SPEED TRAIN

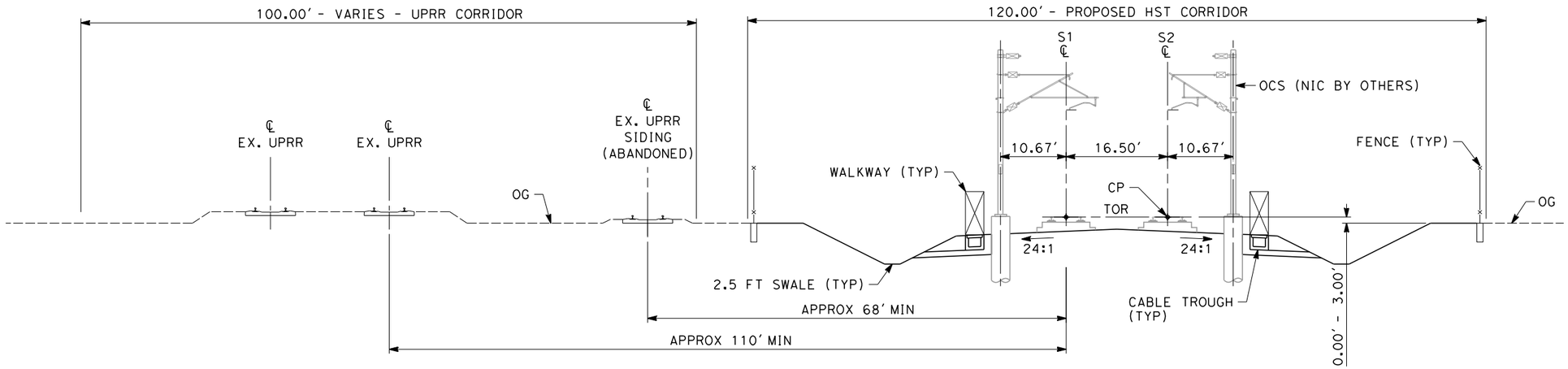
CALIFORNIA
HIGH-SPEED RAIL AUTHORITY

CALIFORNIA HIGH-SPEED TRAIN PROJECT
SIERRA SUBDIVISION
PACKAGE 1C
TRACK GUIDEWAY
PLAN AND PROFILE
STA. 11114+00 TO STA. 11142+00

CONTRACT NO.
DRAWING NO. TT-D1021
SCALE AS SHOWN
SHEET NO.

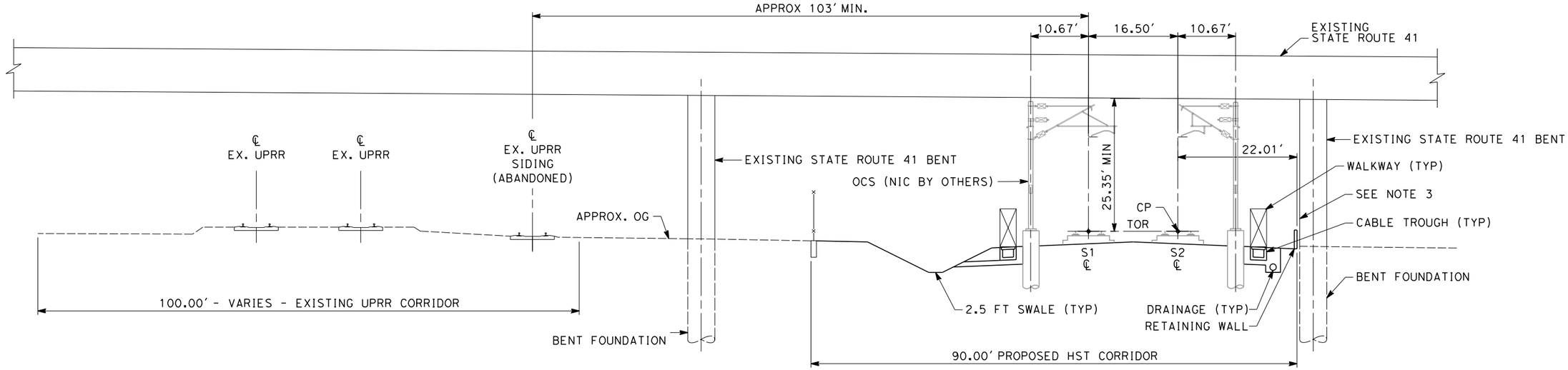
HSR 13-06 - EXECUTION VERSION

Appendix B – Typical Section Drawings



SECTION 22

"S" 11030+00 THROUGH 11037+00
"S" 11039+50 THROUGH 11069+40
TWIN TRACK - AT GRADE



SECTION 23

"S" 11037+00 THROUGH 11039+50
TWIN TRACK - AT GRADE UNDER STATE ROUTE 41

10 0 10 20
1"=10'
SCALE APPLICABLE FOR FULL SIZE ONLY

NOTES:

1. TRACKFORM SHOWN FOR INFORMATION ONLY (NIC BY OTHERS).
2. SUPERELEVATION IS NOT SHOWN. THE AMOUNT OF APPLIED SUPERELEVATION IS SHOWN IN THE CURVE DATA TABLES.
3. HST DERAILMENT CONTAINMENT OR PIER PROTECTION MAY BE REQUIRED. TO BE DETERMINED THROUGH A SITE SPECIFIC HAZARD ANALYSIS.

HSR 13-06 - EXECUTION VERSION

REV	DATE	BY	CHK	APP	DESCRIPTION

DESIGNED BY K. SEYMOUR
DRAWN BY P. TONKIN
CHECKED BY D. HUNT
IN CHARGE R. COFFIN
DATE 06/06/12

PROPOSED PRELIMINARY DESIGN

NOT FOR CONSTRUCTION

URS | HMM | ARUP
CALIFORNIA HIGH-SPEED TRAIN

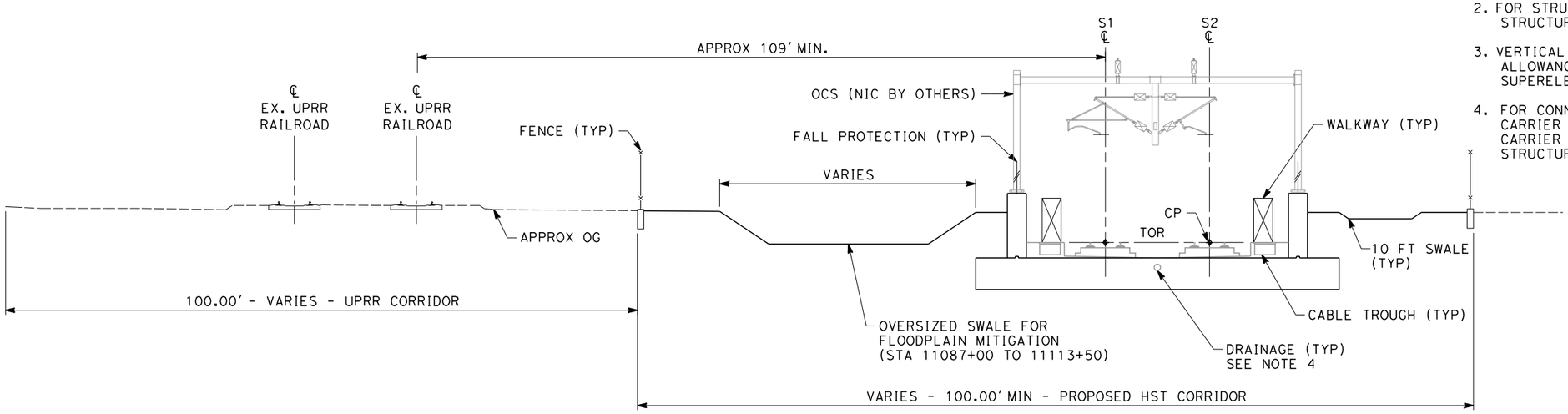
CALIFORNIA HIGH-SPEED RAIL AUTHORITY

CALIFORNIA HIGH-SPEED TRAIN PROJECT
SIERRA SUBDIVISION
PACKAGE 1C
TRACK GUIDEWAY
TYPICAL SECTIONS

CONTRACT NO.
DRAWING NO. TT-D3012
SCALE AS SHOWN
SHEET NO.

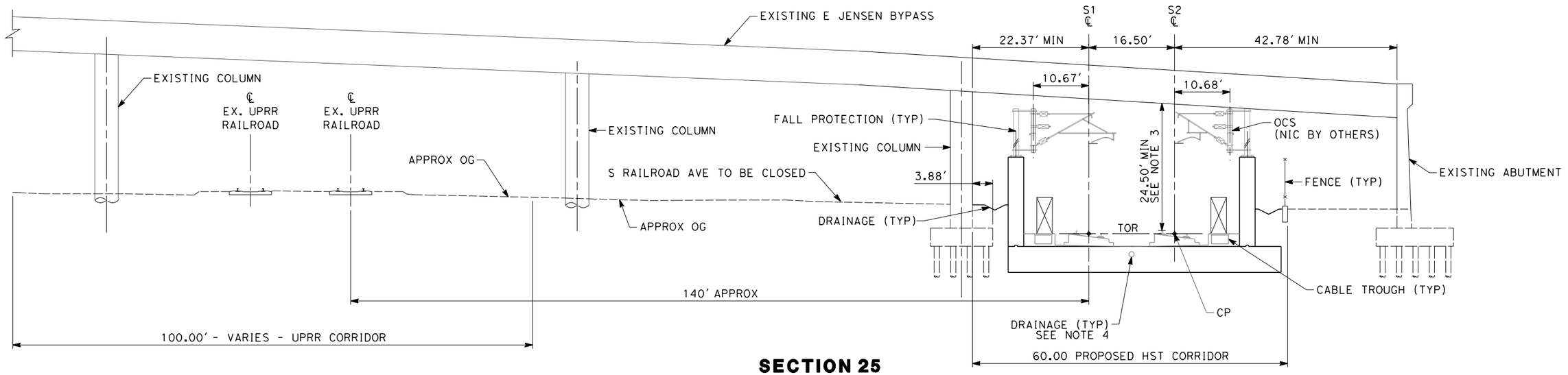
NOTES:

1. TRACKFORM SHOWN FOR INFORMATION ONLY (NIC BY OTHERS).
2. FOR STRUCTURE DIMENSIONS SEE STRUCTURAL TYPICAL SECTIONS.
3. VERTICAL CLEARANCE INCLUDES ALLOWANCE FOR UP TO 7 INCHES OF SUPERELEVATION.
4. FOR CONNECTION TO LONGITUDINAL CARRIER DRAIN AND LONGITUDINAL CARRIER DRAIN LOCATION SEE STRUCTURAL TYPICAL SECTIONS.



SECTION 24

"S" 11069+40 THROUGH 11120+25
"S" 11122+40 THROUGH 11137+00
TWIN TRACK - IN TRENCH



SECTION 25

"S" 11120+25 THROUGH 11122+40
TWIN TRACK - IN TRENCH UNDER E JENSEN AVE

10 0 10 20
1"=10'
SCALE APPLICABLE FOR FULL SIZE ONLY

REV	DATE	BY	CHK	APP	DESCRIPTION

DESIGNED BY K. SEYMOUR
DRAWN BY P. TONKIN
CHECKED BY D. HUNT
IN CHARGE R. COFFIN
DATE 06/06/12

PROPOSED PRELIMINARY DESIGN

NOT FOR CONSTRUCTION

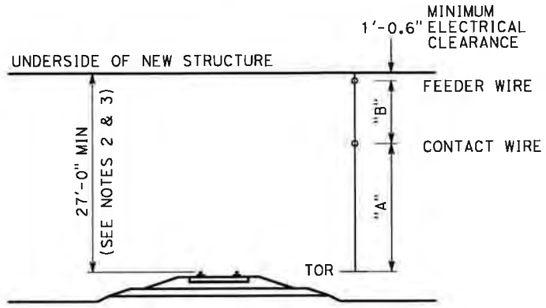
URS | HMM | ARUP
CALIFORNIA HIGH-SPEED TRAIN

CALIFORNIA HIGH-SPEED RAIL AUTHORITY

CALIFORNIA HIGH-SPEED TRAIN PROJECT
SIERRA SUBDIVISION
PACKAGE 1C
TRACK GUIDEWAY
TYPICAL SECTIONS

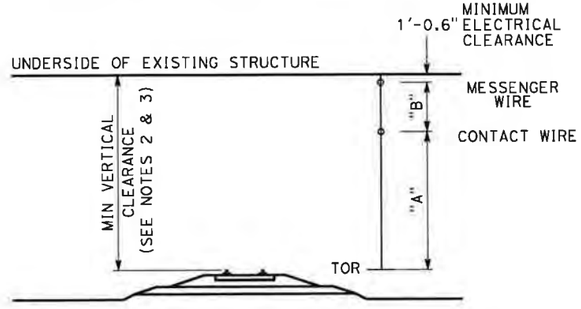
CONTRACT NO.
DRAWING NO. TT-D3013
SCALE AS SHOWN
SHEET NO.

Appendix C – TM and Directive Drawing Extracts



NEW STRUCTURE OVER HST TRACKS

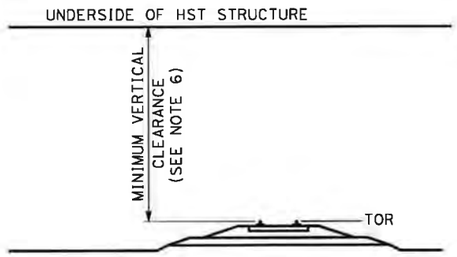
	HEIGHT "A"	HEIGHT "B"	MIN VERTICAL CLEARANCE
DEDICATED HST TRACK	17'-5"	8'-3.5"	27'-0"
SHARED USE TRACK	18'-9"	7'-0.5"	27'-0"



EXISTING STRUCTURE OVER HST TRACKS

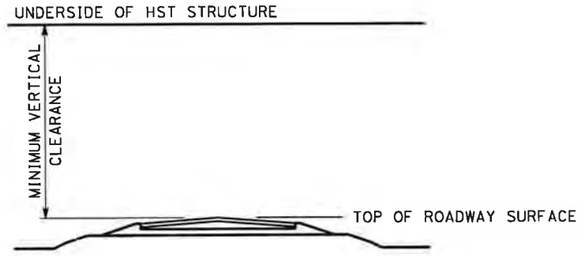
	HEIGHT "A"	HEIGHT "B"	MIN VERTICAL CLEARANCE
DEDICATED HST TRACK	17'-5"	8'-3.5"	27'-0"
DEDICATED HST TRACK (V ≤ 125 MPH)	17'-5"	5'-3"	24'-0"*
SHARED USE TRACK	18'-9"	4'-0"	24'-6"*

* SEE NOTE 2



NEW HST STRUCTURE OVER TRACK

	MIN VERTICAL CLEARANCE
FREIGHT TRACKS	
BNSF	23'-4"
UPRR	23'-0"
NON-FREIGHT TRACKS	
METROLINK	24'-0"
CALTRAIN	24'-6"



NEW HST STRUCTURE OVER ROADWAY

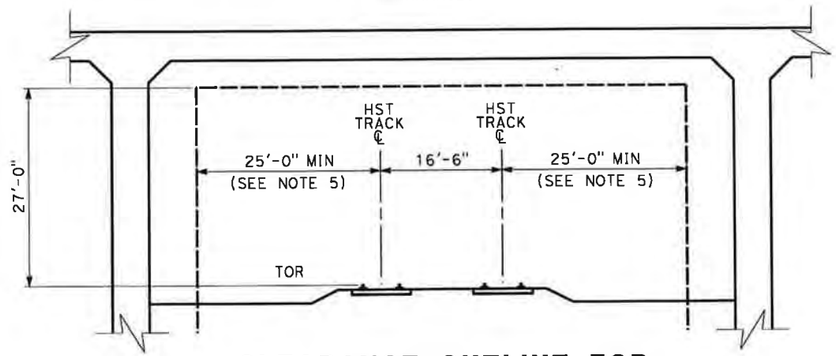
	MIN VERTICAL CLEARANCE
FREEWAY/EXPRESSWAY	16'-6"
LOCAL ROADWAY	15'-0" *
EXTRA LEGAL LOAD NETWORK(ELLN)	20'-3"

* SEE NOTE 4

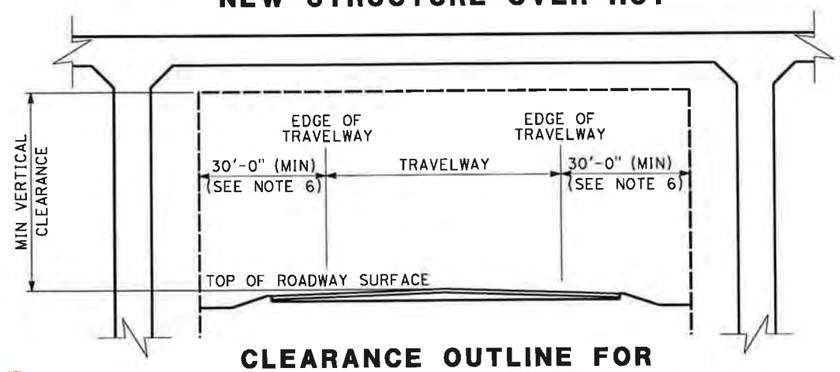
DRAFT

NOTES:

1. TOLERANCES ARE NOT ADDITIVE FOR INCREMENTAL DISTANCES.
2. DEFINED CLEARANCES ASSUMES GRADE SEPARATED STRUCTURE LENGTH ALONG TRACK IS NO MORE THAN 160 FEET FOR HST TRACK OVER 125 MPH. THE OCS SHALL BE FREE RUNNING UNDER GRADE SEPARATED STRUCTURES WITH NO SUPPORTS. STRUCTURES WIDER THAN 160' REQUIRE FURTHER ENGINEER APPROVAL.
3. AT LOCATIONS WHERE SUPERELEVATION IS PRESENT, VERTICAL CLEARANCES SHALL BE MEASURED FROM THE HIGH RAIL.
4. AT LOCAL ROADWAYS, 15 FEET MINIMUM VERTICAL CLEARANCE SHOULD BE DISCUSSED WITH LOCAL AGENCY FOR CONCURRENCE.
5. PROTECTIVE STRUCTURE IS REQUIRED IF SIDE CLEARANCE IS LESS THAN 25 FEET.
6. RIGID TRAFFIC BARRIER MAY BE REQUIRED IF SIDE CLEARANCE IS LESS THAN 30 FEET.
7. SEE APPLICABLE LOCAL DESIGN CRITERIA FOR SIDE CLEARANCE.



CLEARANCE OUTLINE FOR NEW STRUCTURE OVER HST



CLEARANCE OUTLINE FOR NEW HST STRUCTURE OVER ROADWAY

	MIN SIDE CLEARANCE
FREEWAY/EXPRESSWAY	30'-0"
OTHER	SEE NOTE 7

REV	DATE	BY	CHK	APP	DESCRIPTION

DESIGNED BY S. MILITELLO
DRAWN BY V. HUANTE
CHECKED BY H. NGUYEN
IN CHARGE J. CHIRCO
DATE 03/01/2012

PARSONS BRINCKERHOFF

CALIFORNIA HIGH-SPEED RAIL AUTHORITY

CALIFORNIA HIGH-SPEED TRAIN PROJECT
CIVIL DIRECTIVE

DRAFT

MINIMUM CLEARANCE
GRADE SEPARATED STRUCTURES

CONTRACT NO.
DRAWING NO. DD-CV-010
SCALE NO SCALE
SHEET NO.

HSR 13-06 - EXECUTION VERSION

Appendix D – As-built Drawings of Existing Structures

FED. ROAD DIV. NO.	STATE	F. A. PROJECT NO.	SHEET NO.	TOTAL SHEETS
7	CALIF.			

DIST.	COUNTY	ROUTE	SECTION	SHEET NO.	TOTAL SHEETS
VII	FRE	41	21/22J	70	161

October 5, 1964

Measured along ℄ Const.

Lt. Bridge: 166' 155' 160' 160' 125'

Rt. Bridge: 112' 162' 160' 160' 125'

Steel Girder Spans — 8' depth — 120' Transition — 4' depth

Bent 9 | Bent 10 | Bent 11 | Bent 12 | Bent 13 | Bent 14

Datum Elev. 240.00

1185 1186 1187 1188 1189 1190 1191 1192 1193

ELEVATION

"G" STREET

LOS ANGELES STREET

"H" STREET

MONTEREY STREET

Foundation for Sign Br.

Edge of deck transition Straight line

Begin Taper 1180+14.789 POC ℄ Const.

1:50 Taper

Varies

Contrast Treatment. (typ)

℄ Const
R = 4000'
Δ = 57°12'35"
L = 3992.810'
T = 2185.087'

NOTE:
⊕ Denotes location of minimum vertical R.R. clearance.
② Denotes location of Deck Drains.
← Denotes direction of out-let in columns.
③ Denotes location of scuppers.

Track to be relocated

PLAN

NOTE:
* Elevations on copper nails one foot from inside face barrier rail.

AS BUILT PLANS
Contract No. 14-014234
Date Completed 6-16-66
Document No. 60000812

THIS SET OF PLANS HAS BEEN CORRECTED TO CORRESPOND TO THE "AS BUILT" PRINTS DATED 6-29-66, AS SUBMITTED BY RESIDENT ENGINEER T. Nagai
TRACINGS CORRECTED BY: RS DATED: 7/6/66

SHEET 2 OF 37

BRIDGE DEPARTMENT
DESIGN SECTION 15

Design Supervisor: R.C. Blahd

DESIGN	By: Warren A. Brooks 7-63	
	Checked: D.F. Moore 1-64	
DETAILS	By: MIZUTANI 7-63	
	Checked: D.F. Moore 1-64	
QUANTITIES	By:	
	Checked:	

STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

SOUTH FRESNO VIADUCT

STRUCTURE PLAN 2

SCALE 1" = 30' | BRIDGE 42-226 R | FILE | DRAWING 42226-J

Disregard prints bearing earlier numbers → PREL. DRAWING No. P-

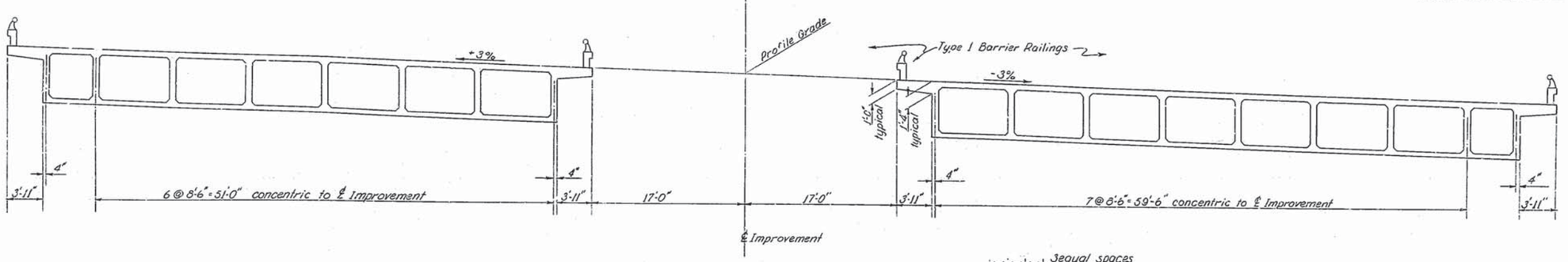
70

HSR 13-06 - EXECUTION VERSION

FED. ROAD DIV. NO.	STATE	F. A. PROJECT NO.	SHEET NO.	TOTAL SHEETS
7	CALIF.			

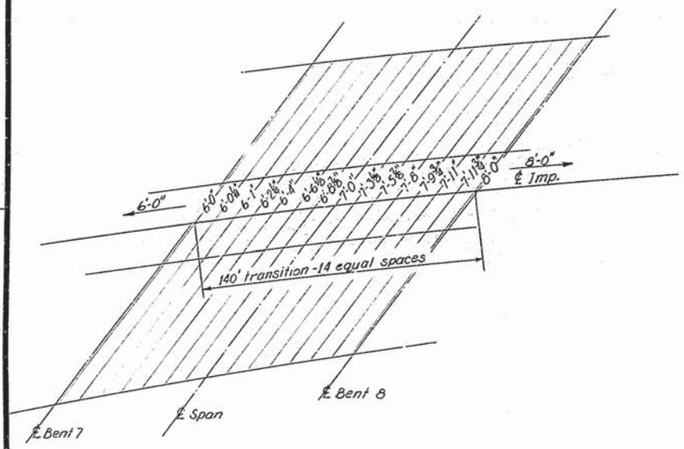
DIST.	COUNTY	ROUTE	SECTION	SHEET NO.	TOTAL SHEETS
VI	FRE	41	29/187	95	161

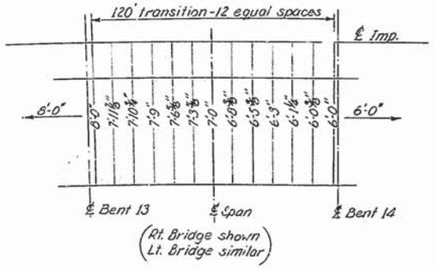
DATE APPROVED: October 5, 1964



TYPICAL SECTION AT STA. 1178+00

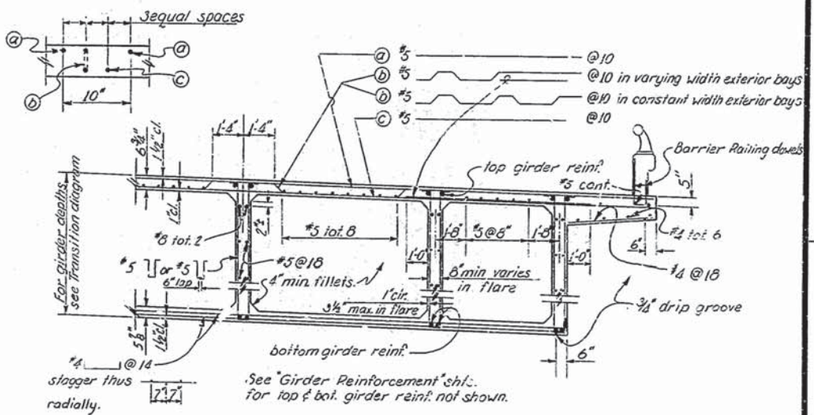
3/16" = 1'-0"





STRUCTURE DEPTH TRANSITIONS

no scale



PART SECTION

3/8" = 1'-0"

THIS SET OF PLANS HAS BEEN CORRECTED TO CORRESPOND TO THE "AS BUILT" PRINT DATED 4/29/66, AS SUBMITTED BY RESIDENT ENGINEER F. Nagel
PRINTING CORRECTED BY: RS DATED 7/1/66

AS BUILT PLANS
Contract No. 14-014234
Date Completed 5-16-66
Document No. 60000018

SHEET OF 29 187

BRIDGE DEPARTMENT DESIGN SECTION 15		
Section Supervisor: R.C. Clark		
DESIGN	By: Vernon A. Banks 10-63	Checked: D.K. Moore 1-64
DETAILS	By: V.A. Banks 10-63	Checked: D.K. Moore 1-64
QUANTITIES	By: various	Checked:

STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

SOUTH FRESNO VIADUCT

TYPICAL SECTION - CONCRETE GIRDERS

SCALE: As noted	BRIDGE: 42-226 R/L	FILE	DRAWING: 42226-19

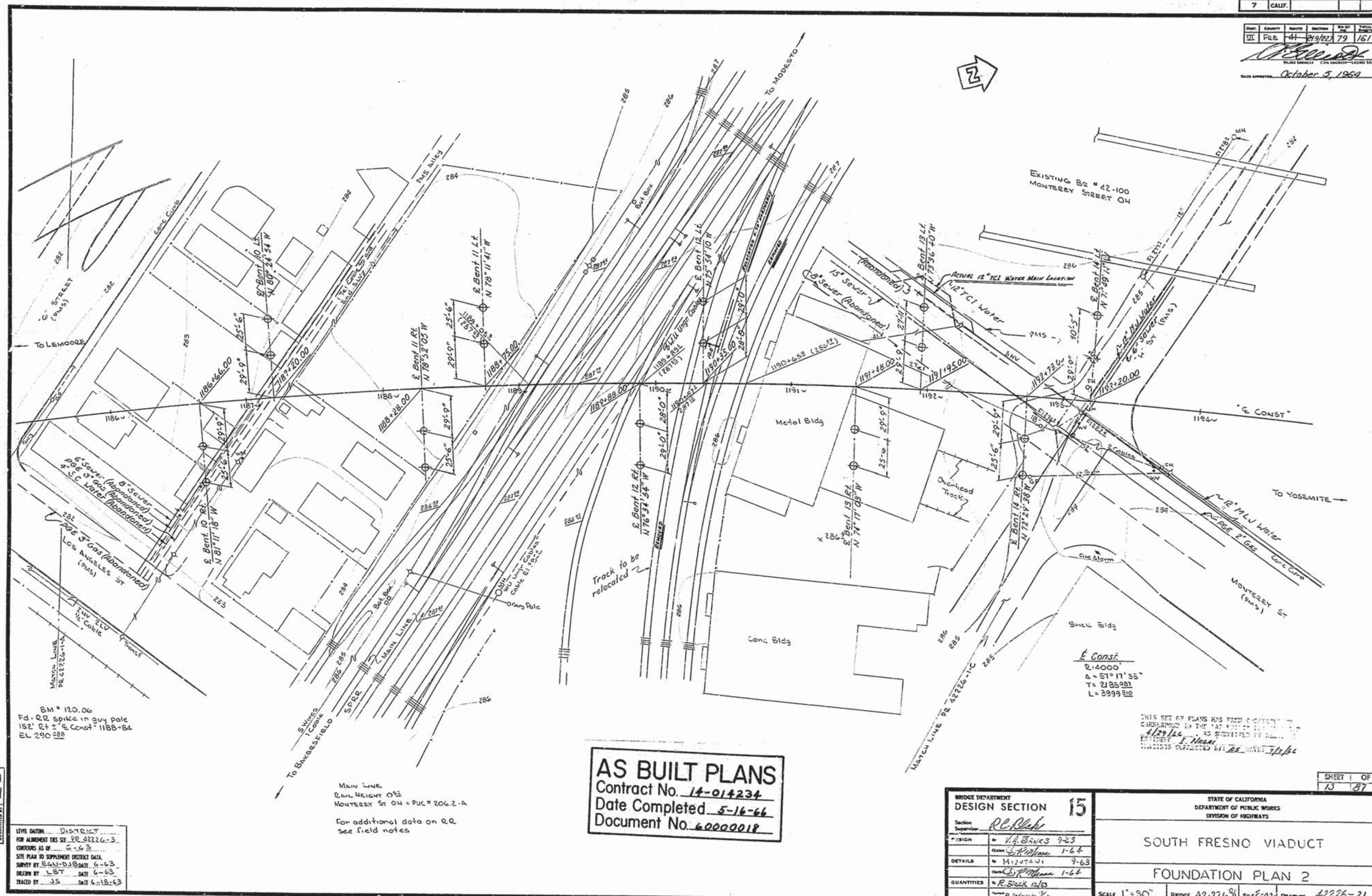
Disregard prints bearing earlier revision dates →

PRELIMINARY DRAWING No.: P 12/5/62 12/5/62 12/7/62 3/7/64 5/7

REVISION DATES

95

HSR 13-06 - EXECUTION VERSION

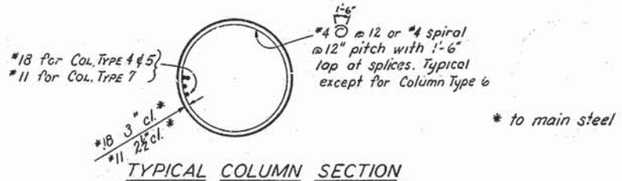


7 CALIF.
VI FRE 41 99/180 79 161
October 5, 1964
EXISTING BR #42-100
MONTEREY STREET OH
To MODESTO
TO LEMOORE
"G" STREET (PMS)
LOS ANGELES ST (PMS)
To BAKERSFIELD
To YOSEMITE
MONTEREY ST (PMS)
"E CONST"
Metal Bldg
Conc Bldg
Shell Bldg
Overhead Track
Track to be relocated
Main Line
SPRR
Guy Pole
Fire Storm
E Const.
R=4000'
Δ=57° 17' 35"
T=2185.83
L=3999.10
BM # 120.06
Fd-RR spike in guy pole
152' Rt ± E Const. 1188-84
EL 290.88
Main Line
Rail Height 0.53
Monterey St OH = PUC# 206.2-A
For additional data on RR see field notes
Match Line PR 42226-1-A
Match Line PR 42226-1-C
AS BUILT PLANS
Contract No. 14-014234
Date Completed 5-16-66
Document No. 60000018
LEVEL DATUM DISTRICT
FOR ALINEMENT THIS SEE PR 42226-3
CONTOURS AS OF 6-63
SITE PLAN TO SUPPLEMENT DISTRICT DATA
SURVEY BY EGU-DJB DATE 6-63
DRAWN BY LBT DATE 6-63
TRACED BY JS DATE 6-18-63
62-06TIOHO142.3
REVISION
UTILITIES
BRIDGE DEPARTMENT
DESIGN SECTION 15
Section Supervisor R.C. Blake
DESIGN V.A. Binks 9-63
DETAILS Mizutani 9-63
QUANTITIES R. Black 12/63
STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS
SOUTH FRESNO VIADUCT
FOUNDATION PLAN 2
SCALE 1"=30"
BRIDGE 42-226 R/L
FILE 42
DRAWING 42226-21
SHEET 13 OF 87
PREL. DRAWING NO.
PR 42226-1-B

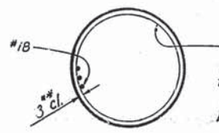
FED. ROAD DIST. NO.	STATE	F. A. PROJECT NO.	SHEET NO.	TOTAL SHEETS
7	CALIF.			

DIST.	COUNTY	ROUTE	SECTION	SHEET NO.	TOTAL SHEETS
VI	FRE	~~41~~	21(22)	85	161

DATE APPROVED October 5, 1964

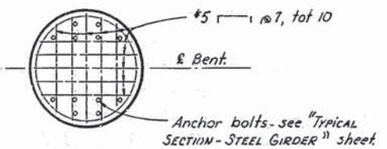


TYPICAL COLUMN SECTION

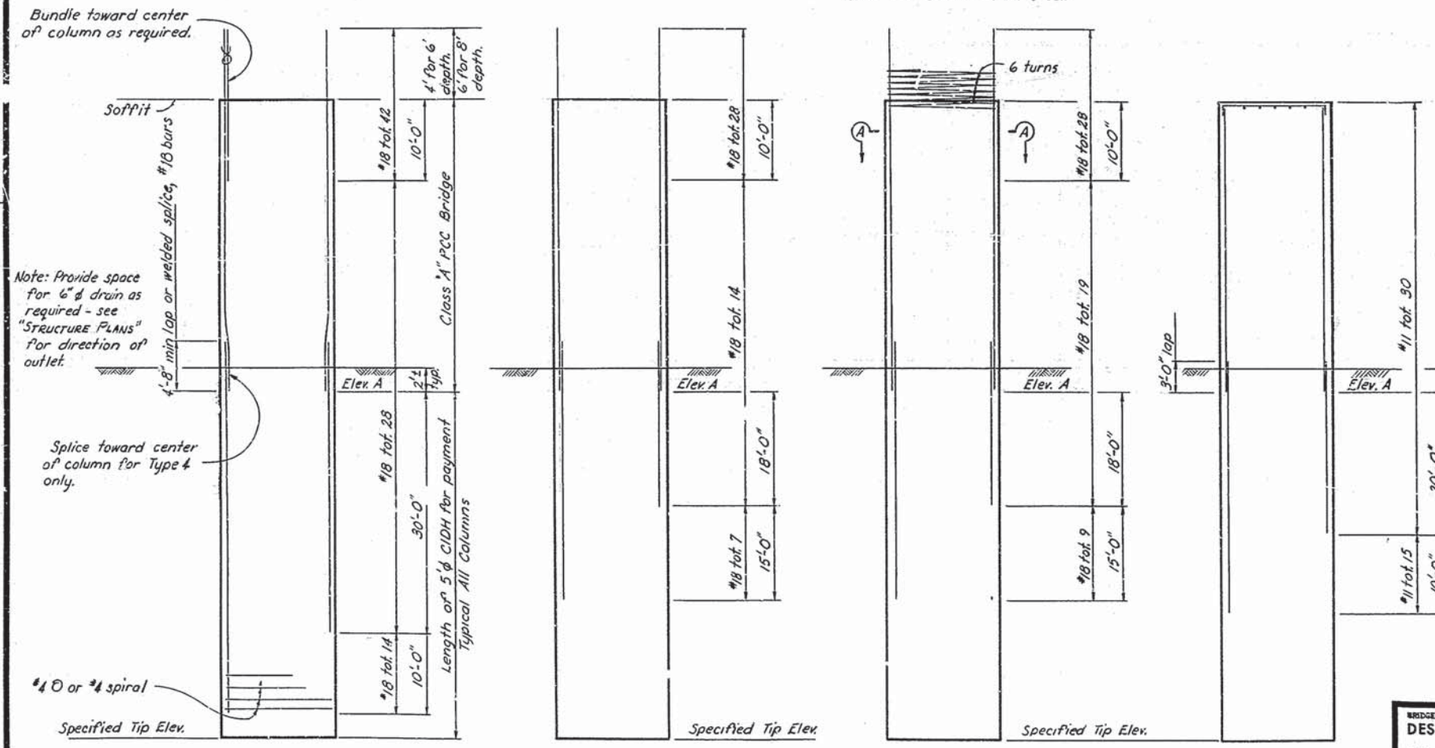


SECTION A-A

Note: See "BENT 17 LT. BR." sheet.



PLAN



COLUMN TYPE 4 | COLUMN TYPE 5 | COLUMN TYPE 6 | COLUMN TYPE 7

AS BUILT PLANS
Contract No. 14-014234
Date Completed 5-16-66
Document No. 60000018

THIS SET OF PLANS HAS BEEN CORRECTED TO CORRESPOND TO THE "AS BUILT" PRINTS DATED 4/29/66, AS SUBMITTED BY RESIDENT ENGINEER E. NEGRI
TRACINGS CORRECTED BY: RS DATE: 7/1/66

SHEET 19 OF 87

BRIDGE DEPARTMENT
DESIGN SECTION 15
Section Supervisor R C Blake

DESIGN	By C.S.H.-P.H.-O.P.M.	1-64
	Checked same	
DETAILS	By Mizutani	1-64
	Checked	
QUANTITIES	By O.R.Thorn	1-64
	Checked P.H.	1-64

STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

SOUTH FRESNO VIADUCT

BENT COLUMNS 2

SCALE NONE | BRIDGE 42-226 R/L | FILE | DRAWING 42226-75

Disregard prints bearing earlier revision dates →

PRELIMINARY DRAWING No. P-1964-21-5/1

REVISION DATES

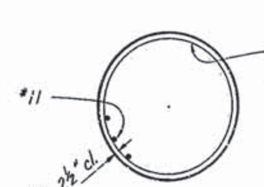
65

FED. ROAD DIV. NO.	STATE	F. A. PROJECT NO.	SHEET NO.	TOTAL SHEETS
7	CALIF.			

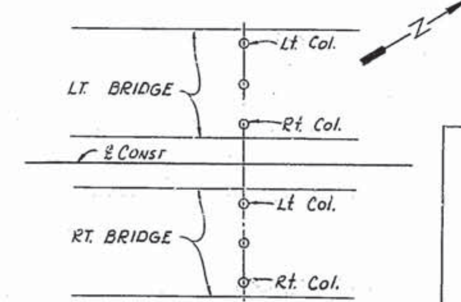
DIST.	COUNTY	ROUTE	SECTION	SHEET NO.	TOTAL SHEETS
VI	FRE	41	219/227	84	161

BRIDGE ENGINEER — CIVIL ENGINEER—LICENSE

DATE APPROVED October 5, 1964

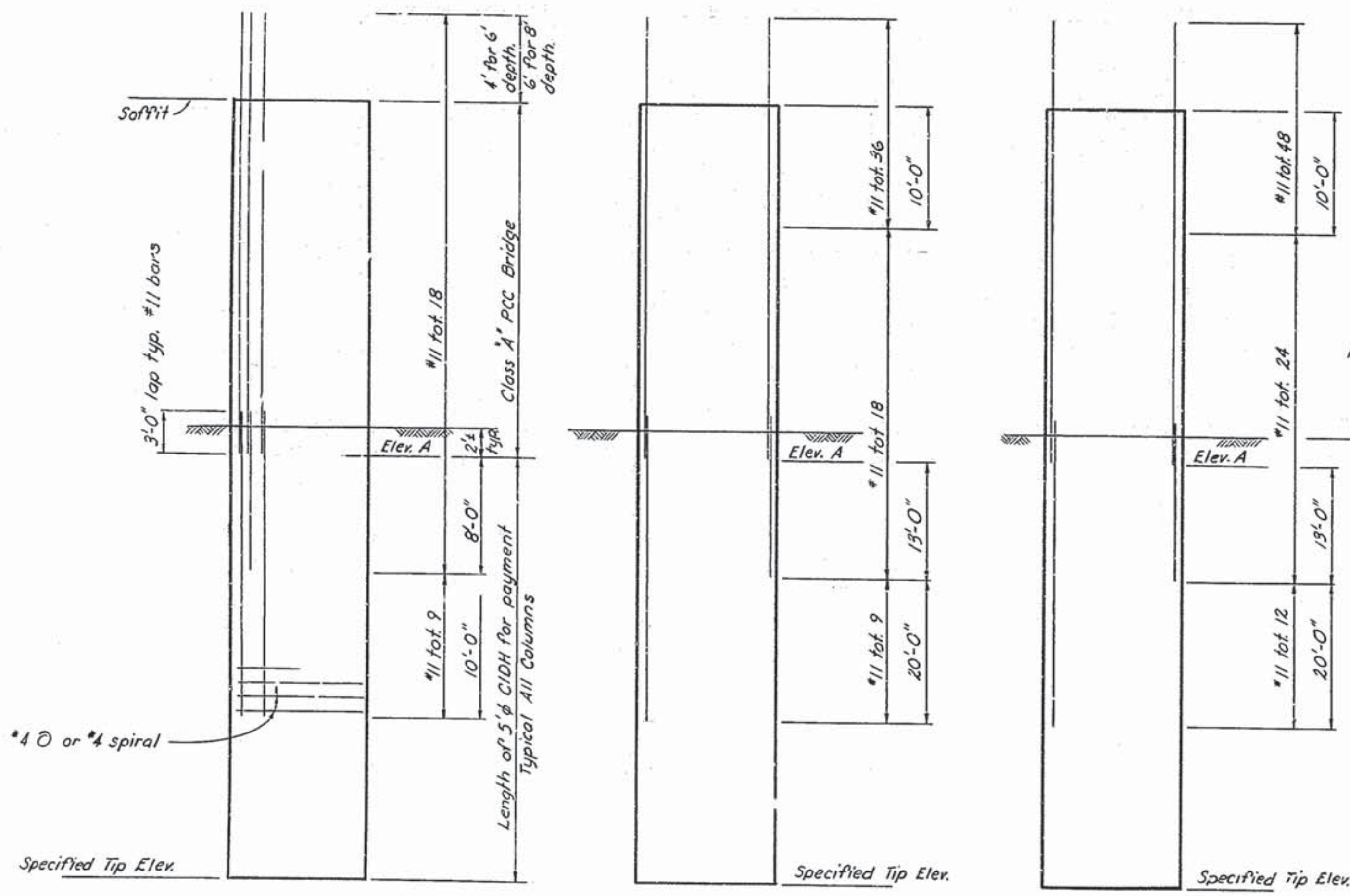


TYPICAL COLUMN SECTION



COLUMN LOCATION KEY

	BENTS	COLUMN TYPE	ELEV. "A" (LT. to RT.)	SPECIFIED TIP ELEVS.	"As Built" Tip Elev. (Lt to Rt)
LEFT BRIDGE	3	5	280'	245'	244^{7} 245^{1}
	4	5	280'	240'	238^{8} 239^{8}
	5.	3	280'	235'	232^{7} 230^{7}
	6.	2	277'	230'	230^{3} 229^{8}
	7	5	276'	250'	240^{2} 238^{6}
	8.	2	290', 288'	245'	244^{5} 245^{5}
	9.	3	280'	245'	243^{5} 241^{8}
	10.	5	282'	240'	235^{6} 238^{2}
	11	4	280 ~~232'~~	236'	234^{5} 234^{1}
	12	7	284'	245'	243^{2} 244^{8}
	13	2	284'	227'	226^{5} 226^{5}
	14	2	283'	225'	209^{9} 226^{5}
	15	2	288', 281'	235'	232^{6} 234^{5}
	16.	5	290', 285'	230'	228^{7} 228^{5}
	17	6	288', 286'	215'	213^{7} 215^{4}
	18	5	288'	240'	239^{2} 236^{9}
RIGHT BRIDGE	3	1	280'	255'	253^{5}, 254^{7}, 251^{7}
	4	1	280'	250'	248^{5}, 250^{1}, 251^{8}
	5	1	277'	247'	245^{8}, 245^{5}, 246^{5}
	6	2	274', 274', 273'	242'	241^{1}, 239^{5}, 240^{8}
	7	5	275'	245'	241^{3}, 239^{5}, 241^{2}
	8	2	285', 284'	245'	244^{4} 245^{8}
	9	3	280'	243'	246^{2} 241^{3}
	10	3	282'	230'	228^{2} 227^{8}
	11	4	280 ~~282'~~ 282	236'	235^{8} 236^{7}
	12	7	284'	253'	254^{5} 252^{5}
	13	2	284'	230'	229^{2} 228^{6}
	14	2	283'	233'	234^{5} 229^{7}
	15	2	281', 282'	253'	246^{3} 242^{4}
	16	5	281'	245'	243^{7} 246^{8}
	17	1	286'	250'	247^{2}, 247^{8}, 249^{2}
	18	1	286'	250'	250^{5}, 249^{5}, 249^{1}



COLUMN TYPE 1 — COLUMN TYPE 2 — COLUMN TYPE 3

NOTE: Provide space for 6"⌀ drain as required - see "STRUCTURE PLANS" for direction of outlet.

AS BUILT PLANS
Contract No. 06-014224
Date Completed 5-16-66
Document No. 60000018

THIS SET OF PLANS HAS BEEN CORRECTED TO CORRESPOND TO THE "AS BUILT" PRINTS DATED 4/29/66, AS SUBMITTED BY RESIDENT ENGINEER I. NAGAI
TRACINGS CORRECTED BY: AS DATE: 7/7/66

SHEET	OF
18	87

BRIDGE DEPARTMENT
DESIGN SECTION 15
Section Supervisor RC Blake

DESIGN	By CSH-DJ/SRM LDR	
	Checked same	
DETAILS	By MIZUTANI	1-64
	Checked ____	
QUANTITIES	By DR [illegible]	1-64
	Checked [illegible]	1-64

STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

SOUTH FRESNO VIADUCT

BENT COLUMNS 1

SCALE NONE | BRIDGE 42-226R/L | FILE | DRAWING 42226-74

Disregard prints bearing earlier revision dates → PRELIMINARY DRAWING No. P 10/6 4/1 5/7 — REVISION DATES

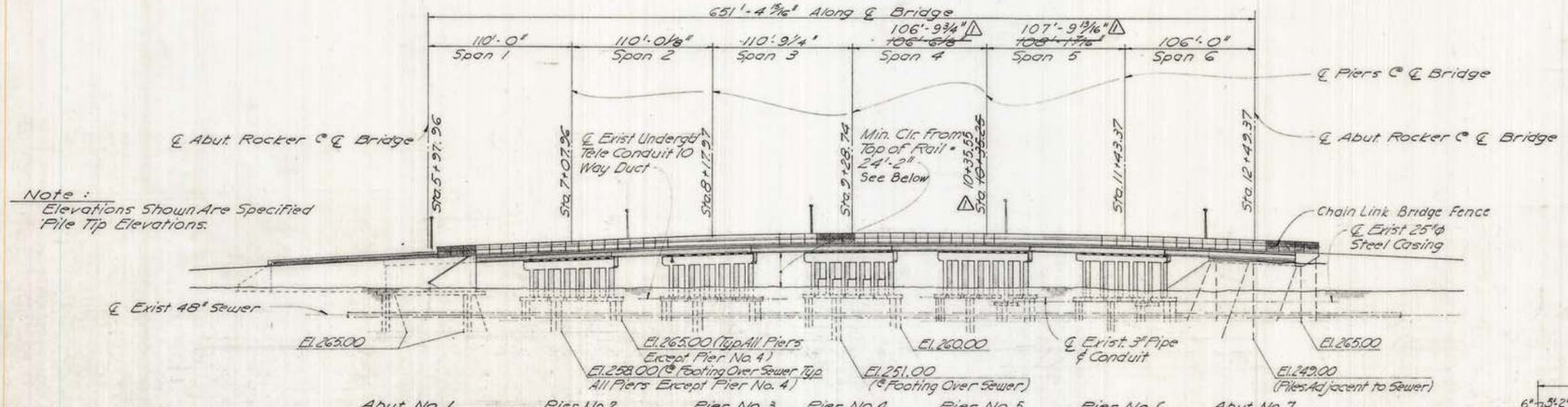
84

HSR 13-06 - EXECUTION VERSION

B.P.R. DIV. NO.	STATE	FEDERAL PROJECT NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
				28	

DIST.	COUNTY	ROUTE	SECTION	SHEET NO.	TOTAL SHEETS
VI	FRE			28	61

APPROVED Samuel M. Black
FRESNO COUNTY DIRECTOR OF PUBLIC WORKS
C.E. LICENCE NO. 8438

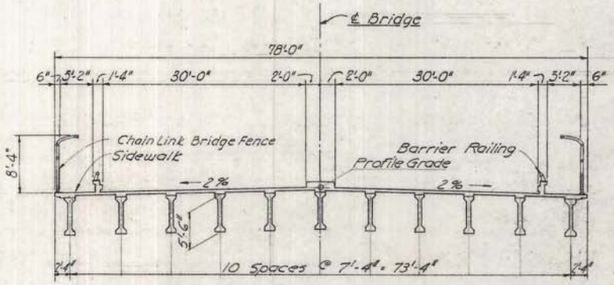


ELEVATION
1" = 50'

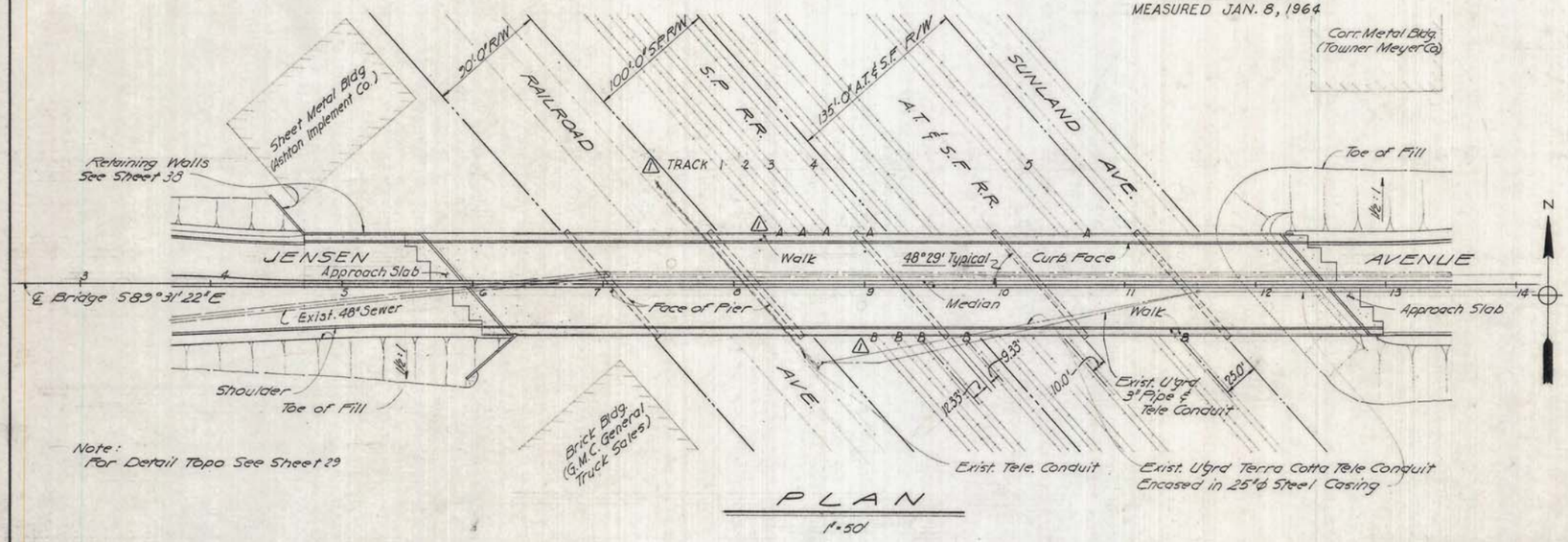
△ VERT. CLEAR. FROM TOP OF RAIL

LOCATION	CLEARANCE
1A	24.41'
1B	25.19'
2A	24.51'
2B	25.29'
3A	25.14'
3B	25.66'
4A	25.41'
4B	25.98'
5A	24.16'
5B	25.04'

MEASURED JAN. 8, 1964



TYPICAL BRIDGE SECTION
1" = 10'



PLAN
1" = 50'

GENERAL NOTES

Specifications

Design : A.A.S.H.O. Dated 1957 with Revisions & as Supplemented by Bridge Planning & Design Manual.

Construction : Standard Specifications, Division of Highways, Dated January, 1960 & the Special Provisions.

Live Loading : H20-S16-44

Unit Stresses :
Reinforced Concrete - fs = 20,000 p.s.i
fc = 1,200 p.s.i
n = 10

Reinforcement : Embedment is Clear to Outside of Bar & is 2" to Main Reinforcement, Except as Noted. Backing for Hooks is Four Diameters, Except as Noted. Where Reinforcing Bars are Spliced they Shall Have a 20 Diameter Lap Unless Otherwise Called for on the Plan.

Pile Loading : 45 Tons Type: Cast-in-drilled Hole Concrete Piles

Prestressing Notes : See Sheet 43

APPROXIMATE QUANTITIES (BRIDGE)

Structures Excavation	2,231	CY *	Furnish 5'-6" Dp. Prestressed Conc. Girders	1,050.34	LF
Structures Backfill	2,636	CY *			
Concrete Piles Cast in Pre-drilled Holes	8,567.7	LF			
Class "A" Concrete (Bridges)	4,179	CY *	Erect 5'-6" Dp. Prestressed Conc. Girders	66	Ea.
Bar Reinforcing Steel (Bridges)	616,538	Lbs.*	Barrier Railing	1,463.1	LF
Rubber Waterstop	674	LF	Chain Link Bridge Fence	1,441.1	LF
Miscellaneous Metal (Bridge)	28,532	Lbs.	4" Cement Pipe	38	LF

* Final Pay Quantities

NO.	REVISION	BY	DATE
△	As Built Plan	GLB	2/26/64

MOFFATT & NICHOL, ENGINEERS
LONG BEACH, CALIFORNIA
DESIGNED BY Limbrick | CHECKED BY Limbrick
DRAWN BY Ely | IN CHARGE Limbrick

COUNTY OF FRESNO, CALIFORNIA
DEPARTMENT OF PUBLIC WORKS

BRIDGE NO. 520-14E

JENSEN AVENUE IMPROVEMENTS
U.S. HIGHWAY 99 TO 490' EAST OF HOLLOWAY AVENUE

GRADE SEPARATION STRUCTURE
PLAN, ELEVATION & TYPICAL SECTION

SCALE Noted | DATE
JOB NO. L-881
SHEET
OF

5 E 396 5128-28

DIETERICH-POST CLEARPRINT 1000H

HSR 13-06 - EXECUTION VERSION

B.P.R. DIV. NO.	STATE	FEDERAL PROJECT NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
				29	

DIST.	COUNTY	ROUTE	SECTION	SHEET NO.	TOTAL SHEETS
VI	FRE			29	61

APPROVED Samuel M. Black
FRESNO COUNTY DIRECTOR OF PUBLIC WORKS
C.E. LICENCE NO. 8438

N

See Sheet 38 For Dimensions Not Shown @ Retaining Wall

Sheet Metal Bldg. (Ashton Implement Co.)

Sht. Met. Stor.

A.P. Ret. Wall Sta. 4+17.47

4" Sewer To Remain

Stucco Bldg. (New Cozy Inn)

Gas Tank Filled With Sand & Conc.

℄ Rockers @ Abut. No. 1 Sta. 5+97.96

Wd. House

Conc. Pad

6' Ch. Link Fence

10' Wire Fence

Ret. Wall Layout Line

Gas Cont Box

Meters

281.08

280.75

280.58

Section Line

℄ EXPRESSWAY & GRADE SEPARATION STRUCTURE

Trans. P.

Inlet

S 89°31'22"E

390'

T.P.

281.17

280.03

280.42

4' Wire Fence

6' Ch. Link Fence

280.75

Ret. Wall Layout Line

Installed Gas Line

P.P.

RAILROAD AVE.

22.5 Sign

Tel. UG Cable Mkr.

Switch

Sht. Box

℄ Pier No. 3 Sta. 8+17.97

℄ Pier No. 2 Sta. 7+07.96

Sig. Boxes

22.5 Sig.

6" Gas

Abandoned Gas Lines

48" Sewer

℄ Pier No. 4 Sta. 9+28.74

282.00

4" Gas

Abandoned Gas Lines

48°29' Typical

Dimensions Are Typical At Piers 3,4

Sig. Box

T.P. & D.M.

Tel. UG Cable Mkr.

10" U.G. Tel. Cable Duct

6" Gas

Installed Gas Line

Brick Bldg. (G.M.C. General Truck Sales)

SUNLAND AVE.

℄ Pier No. 5 Sta. 10+35.55

℄ Pier No. 6 Sta. 11+43.37

Fire Hyd.

4" Gas

Sig. Box

22.5 Sig.

280.00

276.50

8" Pipe ℄ Cond. Crossing

12" Tel. Conduit in 18" Casing

Sig. Cont. Boxes

See Sheet 35 for Footings This Pier

Corr. Metal Bldg. (Towner Meyer Co.)

307.10

℄ Rockers @ Abut. No. 7 Sta. 12+49.37

10" Gas

Abandoned Gas Lines

12" Tel. Duct

T.P. & D.M.

See Sheet 36 for Footings This Pier

305.12

T.P. & D.M.

T.P.

SECTION A-A

1'-3 1/2" 2" 11 1/2" 2" #6 Tot. 4

CAST-IN-DRILLED HOLE CONCRETE PILE

Bottom Of Footing

3" Min.

1'-6"

℄ Cut-off Line

No. 5 Wire @ 6" Pitch

A A

Length For Payment

Drilled Hole Filled W/ Class "A" Concrete

Note: Elevation @ Bottom Of Pier Footings = 280.00 Unless Otherwise Noted

Indicates Bottom Of Footing Elevation

Contours Shown As Of - July 3, 1961

NO.	REVISION	BY	DATE
△	As Built Plan	GLB	2266

MOFFATT & NICHOL, ENGINEERS
LONG BEACH, CALIFORNIA

DESIGNED BY Neill | CHECKED BY Limbrick
DRAWN BY Mallion | IN CHARGE Limbrick

COUNTY OF FRESNO, CALIFORNIA
DEPARTMENT OF PUBLIC WORKS

JENSEN AVENUE IMPROVEMENTS
U.S. HIGHWAY 99 TO 490' EAST OF HOLLOWAY AVENUE
GRADE SEPARATION STRUCTURE
FOUNDATION PLAN

SCALE 1"=30' | DATE
JOB NO. L-881
SHEET
OF

5E395 5128-29

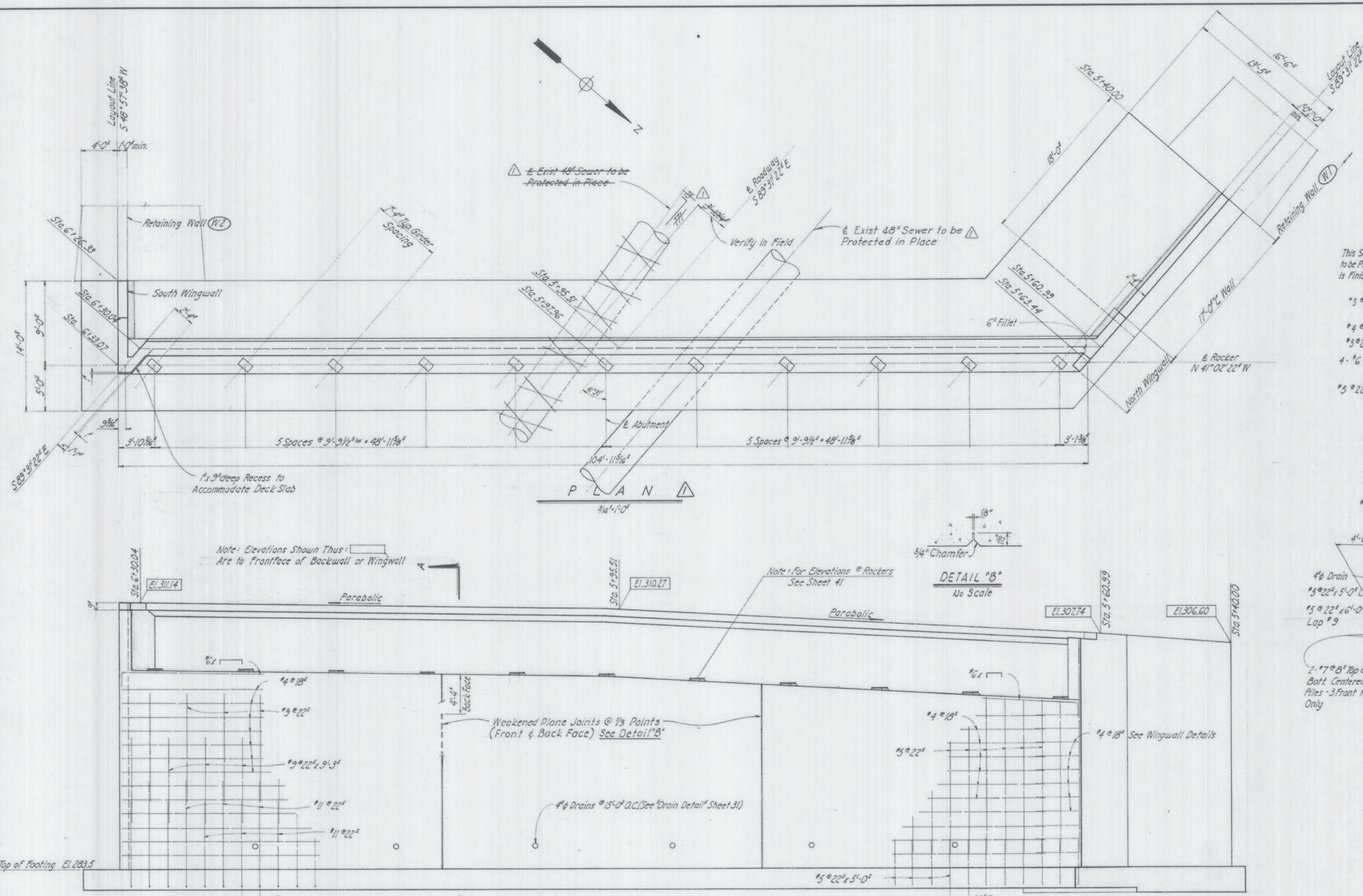
DIETERICH-POST CLEARPRINT 1000H-8

HSR 13-06 - EXECUTION VERSION

B.P.R. DIV. NO.	STATE	FEDERAL PROJECT NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
				30	

DIST.	COUNTY	ROUTE	SECTION	SHEET NO.	TOTAL SHEETS
VI	FRE			30	61

APPROVED Samuel M. Black
FRESNO COUNTY DIRECTOR OF PUBLIC WORKS
C.E. LICENCE NO. 8435



NO.	REVISION	BY	DATE
1	As Built Plan	SLB	2-2664

MOFFATT & NICHOL. ENGINEERS
LONG BEACH, CALIFORNIA

DESIGNED BY Ueill | CHECKED BY Limbrick
DRAWN BY E.Ly | IN CHARGE Limbrick

COUNTY OF FRESNO, CALIFORNIA
DEPARTMENT OF PUBLIC WORKS
JENSEN AVENUE IMPROVEMENTS
U.S. HIGHWAY 99 TO 490' EAST OF HOLLOWAY AVENUE
GRADE SEPARATION STRUCTURE
ABUTMENT NO. 1

SCALE Noted | DATE
JOB NO. L-881
SHEET
OF

5E394 5128-30

DIETERICH-POST CLEARPRINT 1000H

HSR 13-06 - EXECUTION VERSION

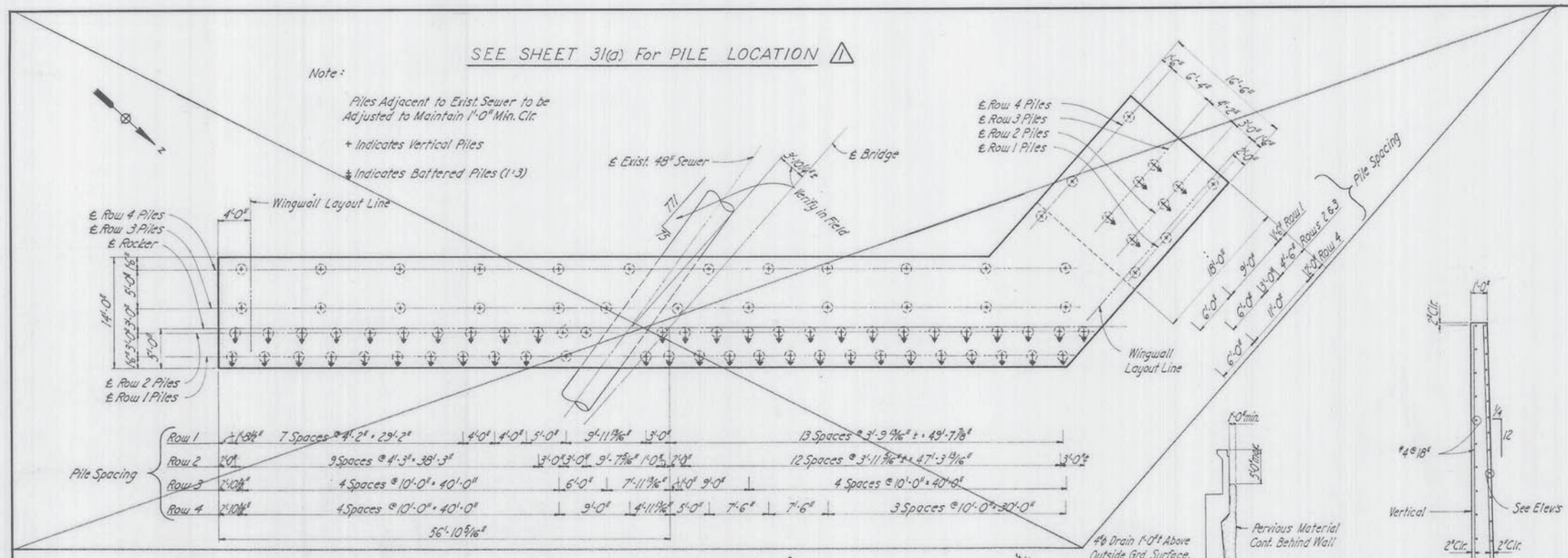
B.P.R. DIV. NO.	STATE	FEDERAL PROJECT NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
				31	

DIST.	COUNTY	ROUTE	SECTION	SHEET NO.	TOTAL SHEETS
VI	FRE			31	61

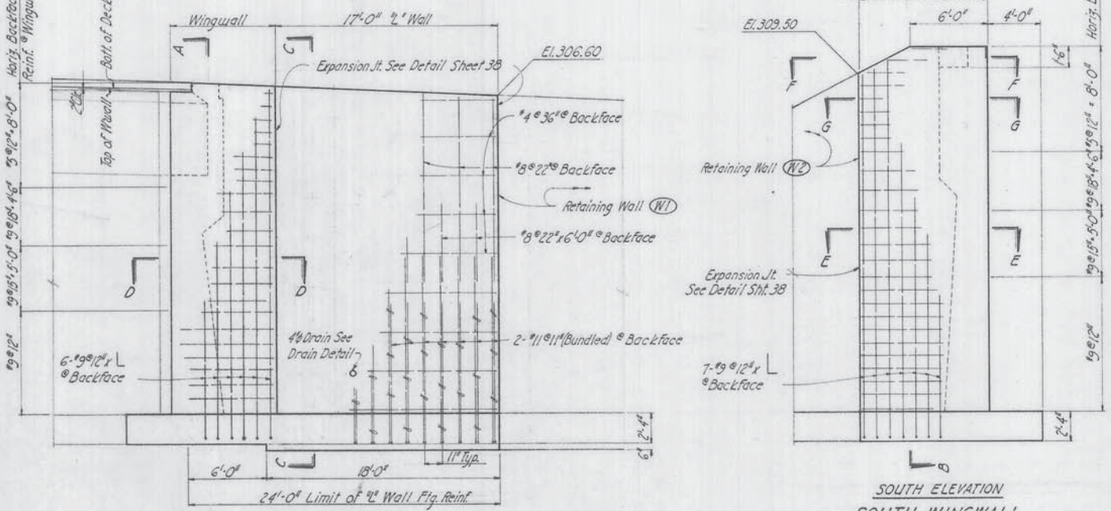
APPROVED Samuel D. Black
FRESNO COUNTY DIRECTOR OF PUBLIC WORKS
C.E. LICENCE NO. 9438

SEE SHEET 31(a) For PILE LOCATION ⚠

Note:
Piles Adjacent to Exist. Sewer to be Adjusted to Maintain 1'-0" Min. Clr.
+ Indicates Vertical Piles
⊥ Indicates Battered Piles (1:3)



PILE LAYOUT ⚠
1/8" = 1'-0"



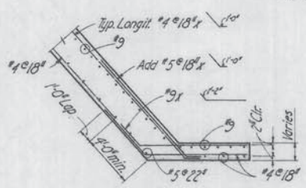
NORTH ELEVATION

NORTH WINGWALL & "L" WALL
Piles Not Shown
3/16" = 1'-0"

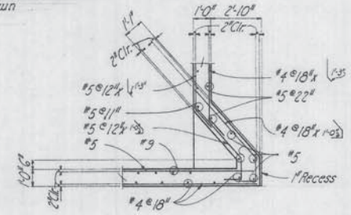
SOUTH ELEVATION

SOUTH WINGWALL
Piles Not Shown
3/16" = 1'-0"

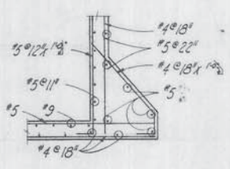
Pile Tip Elev. = 265.00



SECTION D-D
SECTION E-E (Similar, but Opp. Hand)
3/16" = 1'-0"



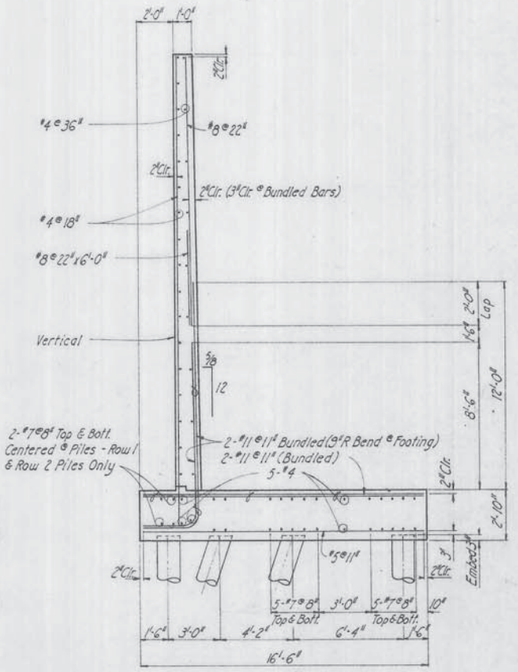
SECTION F-F
1/4" = 1'-0"



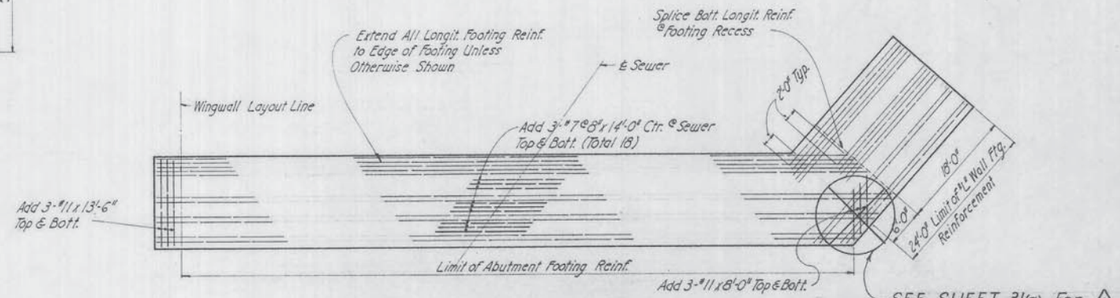
SECTION G-G
1/4" = 1'-0"

DRAIN DETAIL
Abutment Shown
"L" Wall Similar
1"=1'-0"

SECTION A-A
SECTION B-B
1/4"=1'-0" (Piles Not Shown)



SECTION C-C
1/4"=1'-0"



FOOTING REINFORCING PLAN ⚠
Transverse Reinf. Not Shown
3/32" = 1'-0"

SEE SHEET 31(a) For REBAR REVISION ⚠

NO.	REVISION	BY	DATE
⚠	As Built Plan	GLB	2-26-64

MOFFATT & NICHOL. ENGINEERS
LONG BEACH, CALIFORNIA

DESIGNED BY Neill | CHECKED BY Limbrick
DRAWN BY Ely | IN CHARGE Limbrick

COUNTY OF FRESNO, CALIFORNIA
DEPARTMENT OF PUBLIC WORKS
JENSEN AVENUE IMPROVEMENTS
U.S. HIGHWAY 99 TO 490' EAST OF HOLLOWAY AVENUE
GRADE SEPARATION STRUCTURE
ABUTMENT NO. 1 — DETAILS

SCALE Noted | DATE
JOB NO. L-881
SHEET
OF

5E393 5128-31

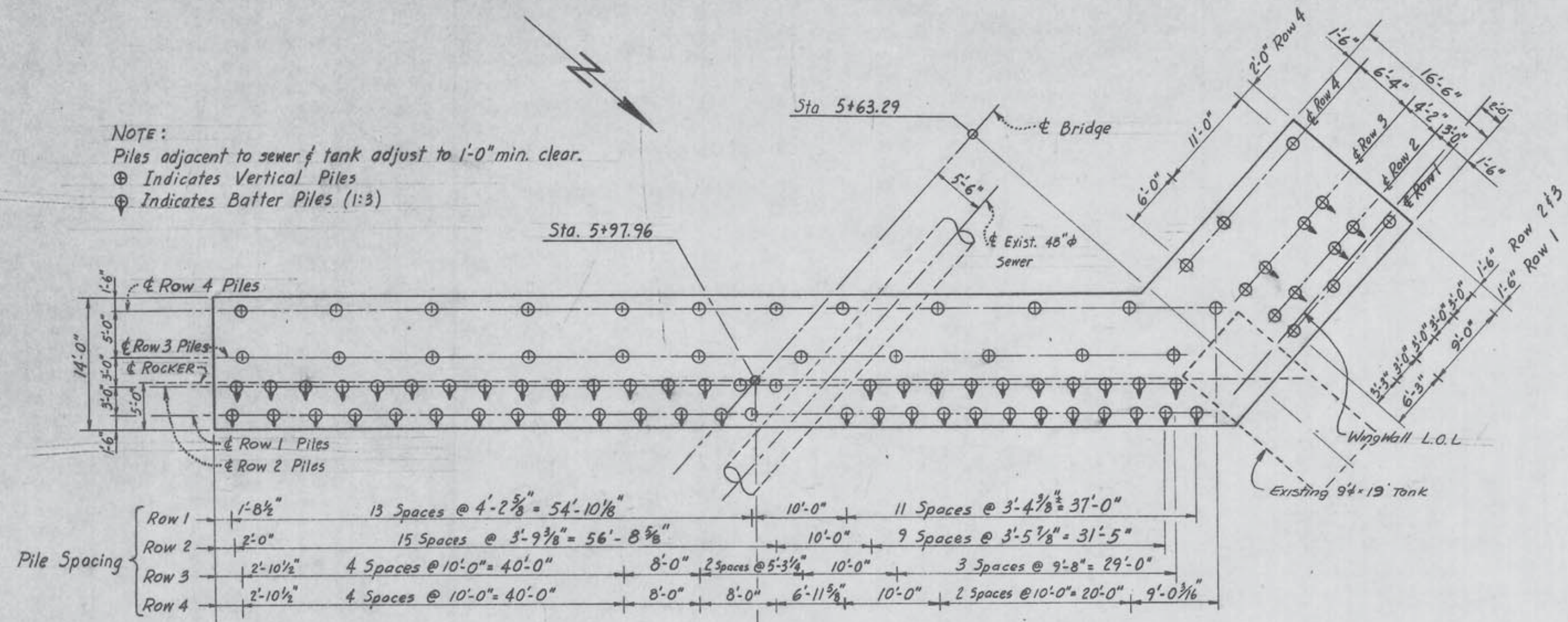
DIETERICH-POST CLEARPRINT 1000H

HSR 13-06 - EXECUTION VERSION

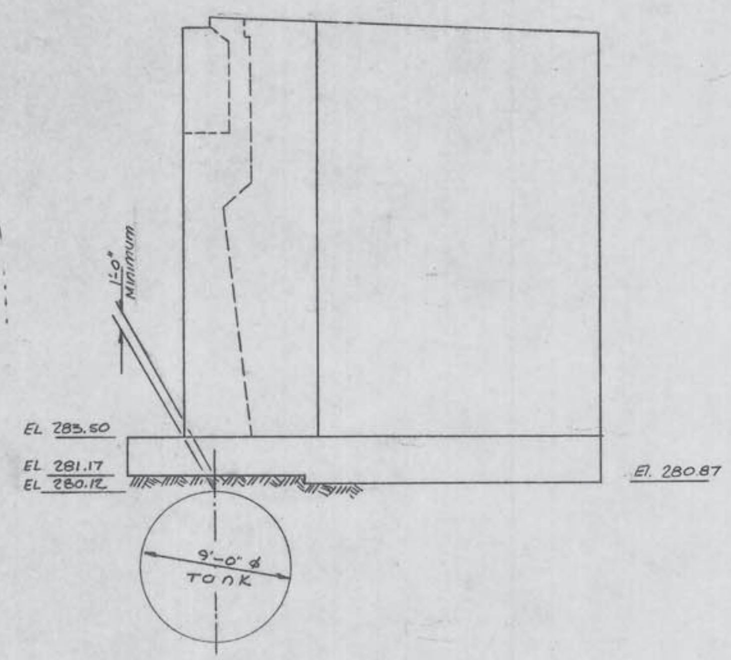
ROAD NUMBER	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
	196	31(a)	

APPROVED Samuel M. Black
FRESNO COUNTY DIRECTOR OF PUBLIC WORKS
CIVIL ENGINEER LICENSE NO. 8438

NOTE:
Piles adjacent to sewer & tank adjust to 1'-0" min. clear.
⊕ Indicates Vertical Piles
⊕ Indicates Batter Piles (1:3)

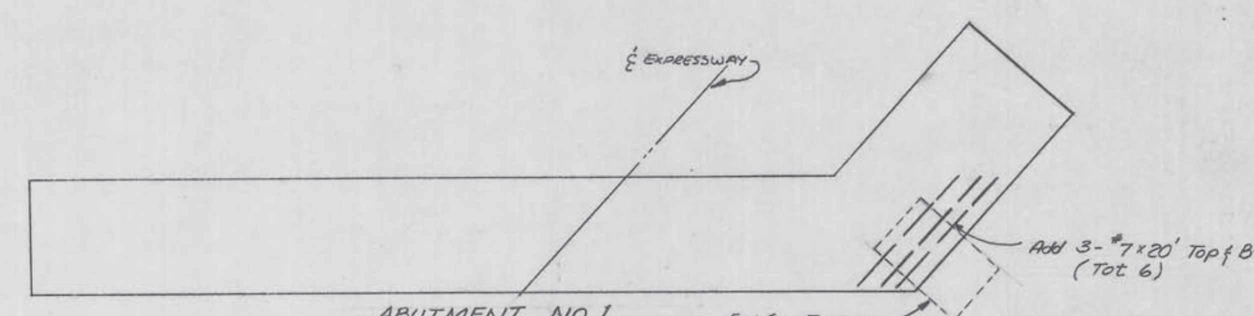


REVISED PILE LAYOUT



EXIST. GAS TANK LOCATION

NOTE: Tank To Be Filled As Directed By The Engineer



ABUTMENT NO 1
FOOTING REINFORCEMENT
(SHOWING ADDED REINF ONLY)

As Built Plan 2-26-64

COUNTY OF FRESNO — CALIFORNIA
DEPARTMENT OF PUBLIC WORKS
HIGHWAYS AND BRIDGES

JENSEN AVENUE IMPROVEMENTS
U.S. 99 to 490' EAST OF HOLLOWAY AVENUE
CONTRACT NO. 62-5-C C.C.O. No. 16 SH. 2 of 2
REVISED PILE LAYOUT AND ADDED REINFORCEMENT @ ABUTMENT NO. 1

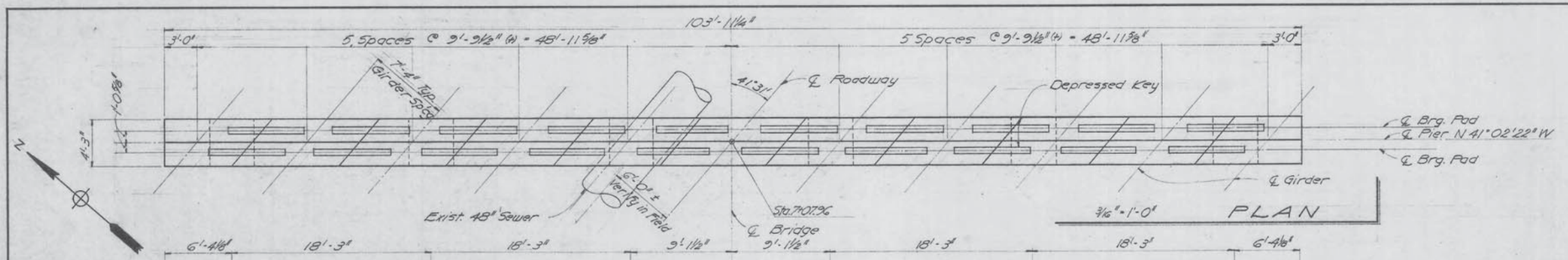
DESIGNED: MOFFATT & NICHOL, ENGRS DATE: 5-14-63 SCALE DRAWING NO
DRAWN: NICHOL, ENGR
CHECKED: BK. PG.
APPROVAL RECOMMENDED: DESIGN ENGINEER 9076 C.E. LICENSE NO.
REVISION DATE

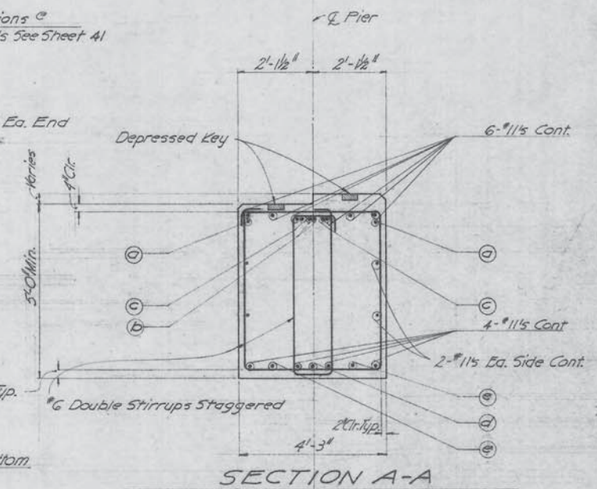
5 E 392

B.P.R. DIV. NO.	STATE	FEDERAL PROJECT NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
				32	

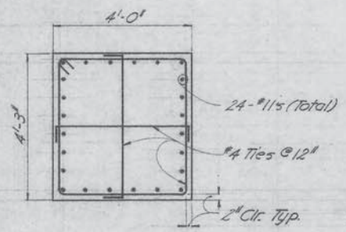
DIST.	COUNTY	ROUTE	SECTION	SHEET NO.	TOTAL SHEETS
VI	FRE			32	61

APPROVED: Samuel M. Black
FRESNO COUNTY DIRECTOR OF PUBLIC WORKS
C.E. LICENCE NO. 6438

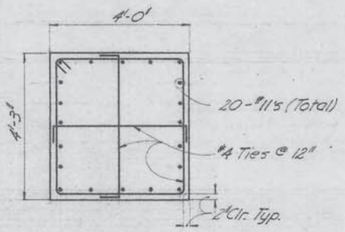




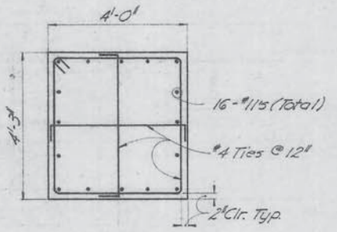
SECTION A-A
½" = 1'-0"



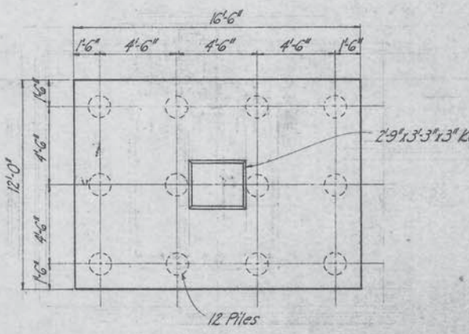
SECTION C-C
½" = 1'-0"



SECTION D-D
½" = 1'-0"



SECTION E-E
½" = 1'-0"



SECTION B-B
¼" = 1'-0"

NO.	REVISION	BY	DATE
	As Built Plan	CLB	2/66

MOFFATT & NICHOL ENGINEERS
LONG BEACH, CALIFORNIA

DESIGNED BY Pease | CHECKED BY Limbrick
DRAWN BY Ely | IN CHARGE Limbrick

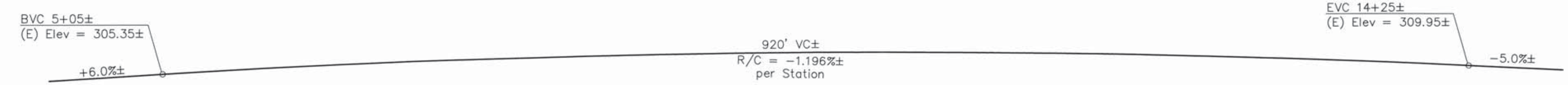
COUNTY OF FRESNO, CALIFORNIA
DEPARTMENT OF PUBLIC WORKS
JENSEN AVENUE IMPROVEMENTS
U.S. HIGHWAY 99 TO 490' EAST OF HOLLOWAY AVENUE
GRADE SEPARATION STRUCTURE
PIER NO. 2

SCALE Noted | DATE
JOB NO. L-881
SHEET
OF

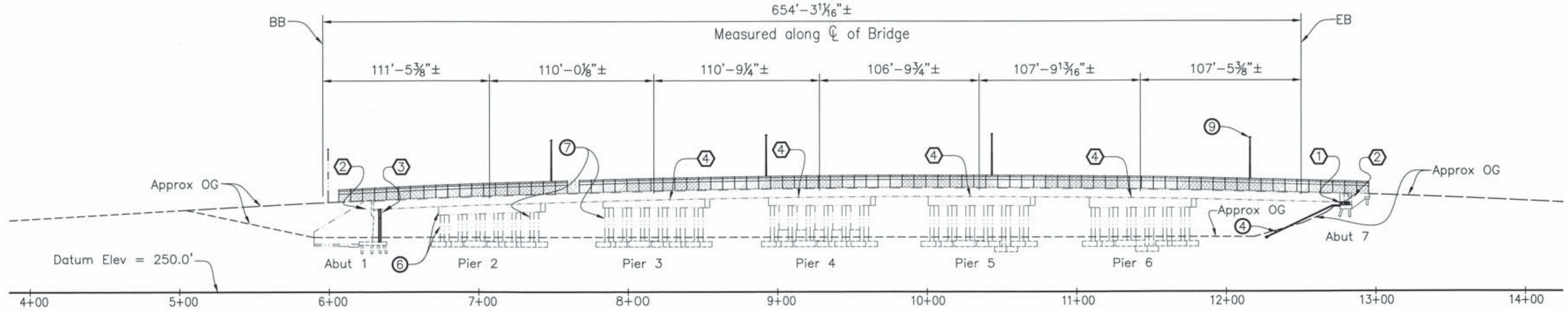
5E391 5128-32

DIETERICH-POST CLEARPRINT 3000H

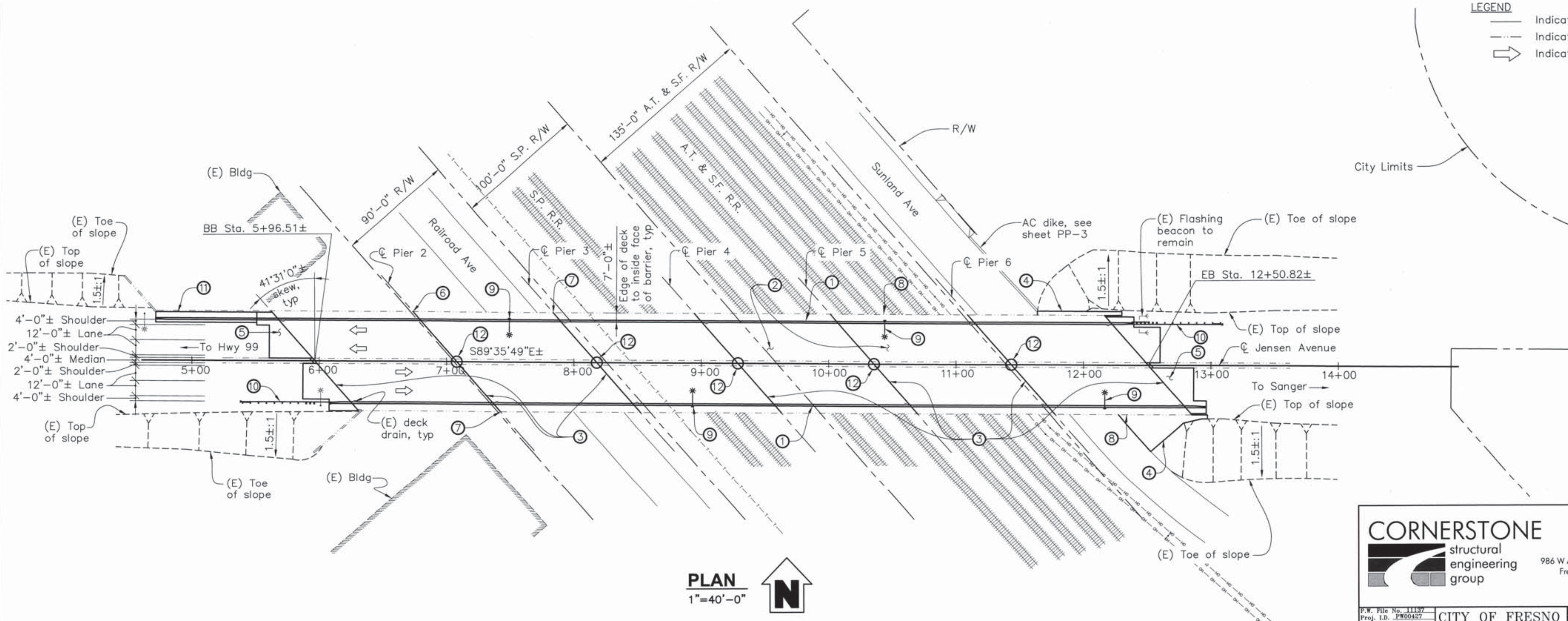
HSR 13-06 - EXECUTION VERSION



PROFILE GRADE
NO SCALE



ELEVATION
1"=40'−0"



PLAN
1"=40'−0"

REHABILITATION LEGEND:

1. Replace existing barriers (deteriorated & substandard) with Type 732 (mod) concrete barriers
2. Place 1" thick polyester concrete overlay, see Typical Section on 'TYPICAL SECTION' sheet S−2 for limits of overlay
3. Replace joint seal for full width between Type 732 (mod) concrete barriers
4. Install concrete slope paving at Abut 7
5. Replace structure approach slabs
6. Patch spalls at Pier 2 and Column 1 of Pier 2
7. Repair damaged deck drain pipe
8. Patch various spalls at overhang with magnesium phosphate concrete
9. Street light, see sheet SL−1
10. MBGR, see Road Plans
11. Remove existing sidewalk with barrier rail and replace as shown on sheet S−7.
12. Patch spalls on median at expansion joints as required

RETROFIT LEGEND:

1. 5'−0"x4'−4"± Concrete catcher block between existing rocker bearings, tot 10
2. Fill 9"± gap between end diaphram and abutment backwall with treated lumber
3. Concrete seat extender, continuous along abutment face
4. Pipe restrainers and concrete bolsters at piers

LEGEND

———	Indicates new construction
—·—·—	Indicates existing bridge
⇨	Indicates direction of traffic

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CORNERSTONE structural engineering group
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559.320.3200
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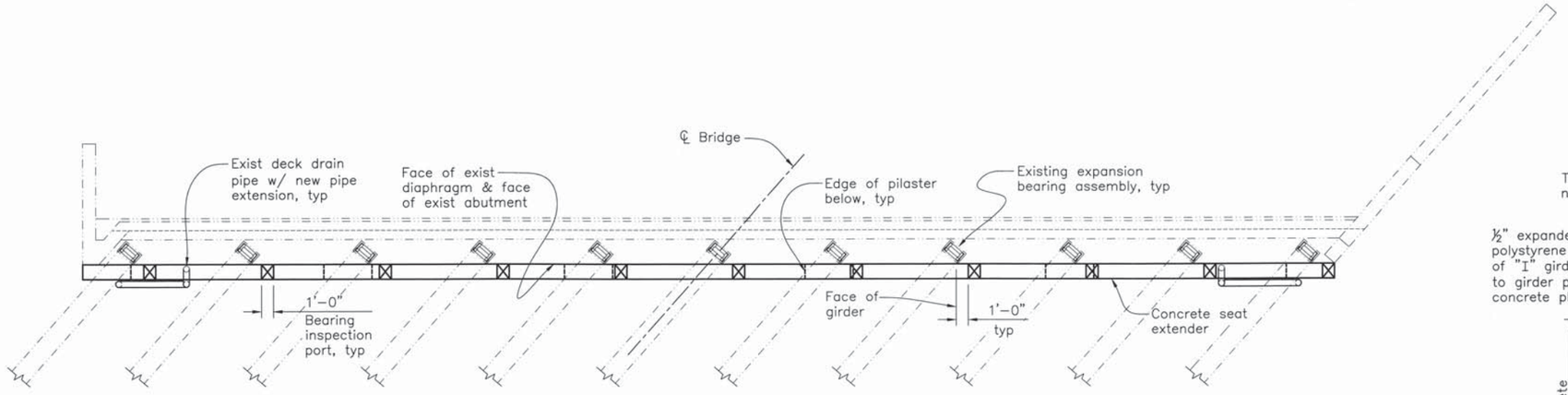
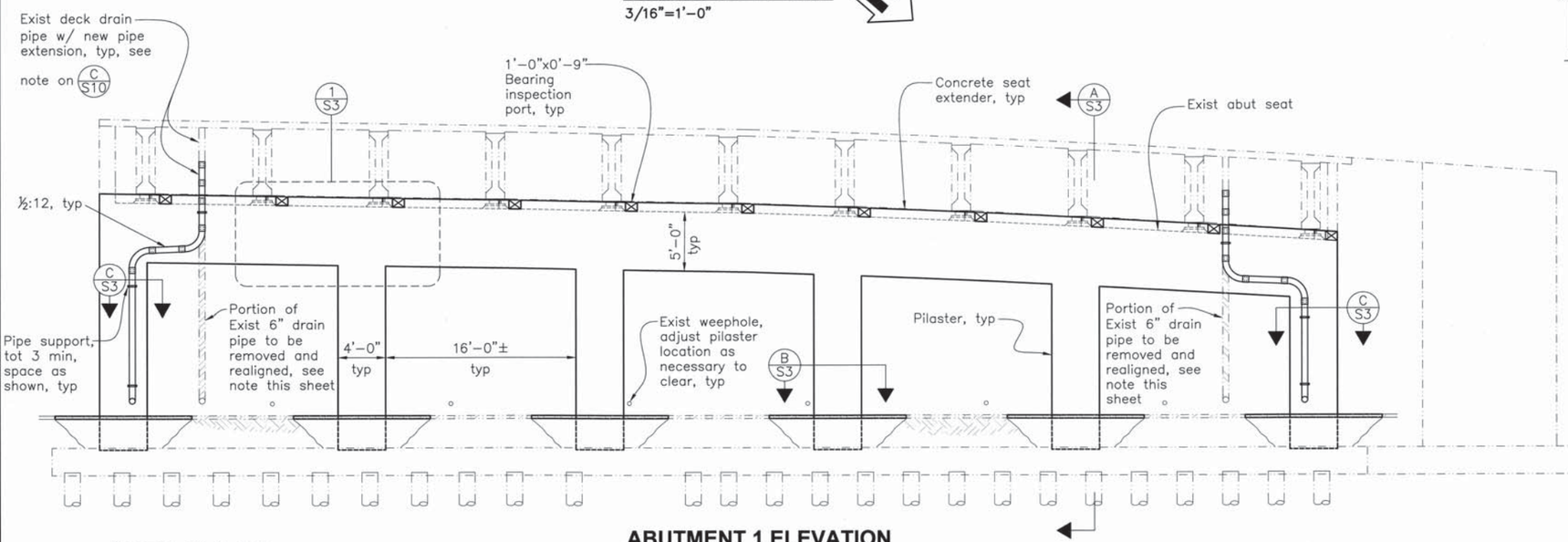
REGISTERED PROFESSIONAL ENGINEER · TODD W. GOOLKASIAN · No. S5843 · EXP. 3/31/13 · STRUCTURAL · STATE OF CALIFORNIA · 6-9-11

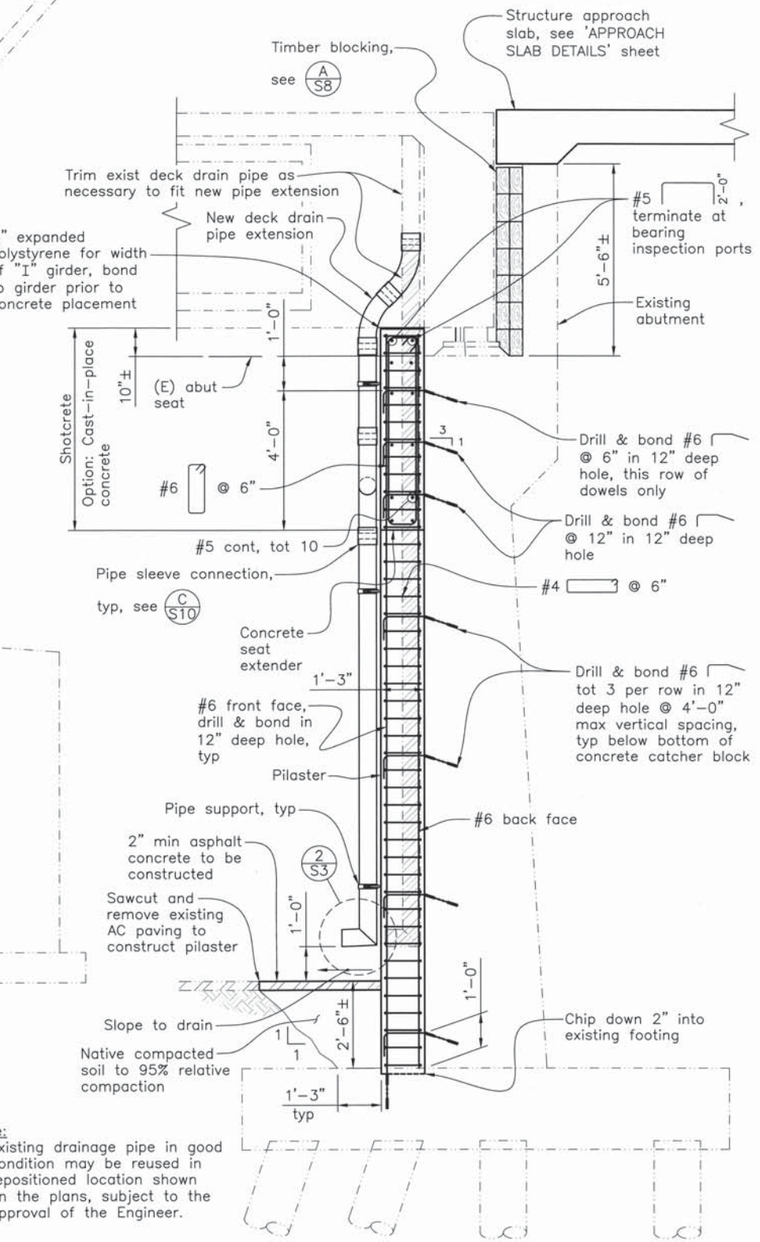
P.W. File No. 11137 Proj. I.D. PW00427 Fund No. 22048 Org. No. 189901 KRA CP001	CITY OF FRESNO	Department of Public Works	
Ref. & Rev.	JENSEN AVENUE OVERHEAD REHABILITATION & RETROFIT GENERAL PLAN	Reviewed By Office Eng. SCJ City Eng. ___ Dr. By: RED Ch. By: BR Date: 06/09/11 Scale: As Noted	Sheet No. S−1 14 of 25 Sheets 5−E−652



ABUTMENT 1 PLAN
3/16"=1'–0"

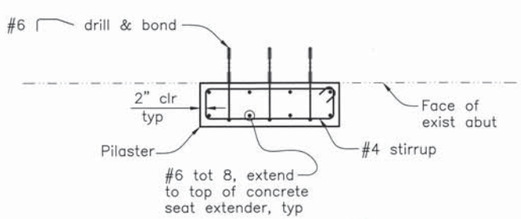


ABUTMENT 1 ELEVATION
3/16"=1'–0"

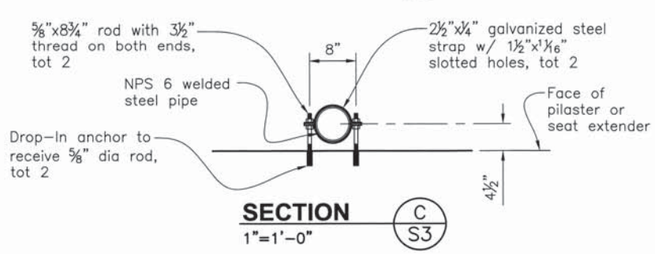


Note:
Existing drainage pipe in good condition may be reused in repositioned location shown on the plans, subject to the approval of the Engineer.

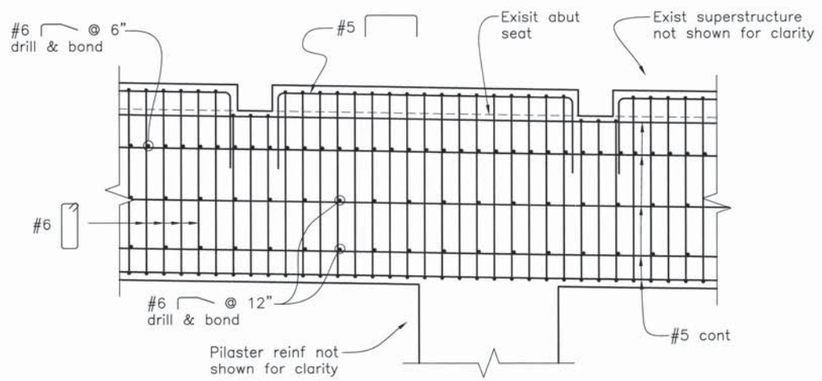
SECTION A S3
1/2"=1'–0"



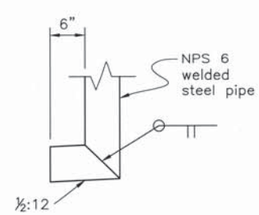
SECTION B S3
1/2"=1'–0"



SECTION C S3
1"=1'–0"



DETAIL 1 S3
1/2"=1'–0"



DETAIL 2 S3
1"=1'–0"

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Proj. I.D. PW00427
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CP001
KRA
Ref. & Rev.

CITY OF FRESNO — Department of Public Works

JENSEN AVENUE OVERHEAD REHABILITATION & RETROFIT

ABUTMENT 1 RETROFIT DETAILS

Reviewed By Office Eng. SG — City Eng.
Dr. By: RED
Ch. By: BR
Date: 06/09/11
Scale: As Noted
Sheet No. S-3
16 of 25 Sheets
5-E-654

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